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REGULATIONS

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LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

RULES AND REGULATIONS.

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AMSTERDAM, *with Veendam, Nieuwediep, and neighbouring Ports* ... *Ship and Engineer Surveyors* (Office, Binnenkant, No. 27, Amsterdam) — *J. B. Slebe, *H. P. Burgdorffer (TELEGRAMS, *Lloyd's Register*)

*Exclusively Officers of Lloyd's Register.

ROTTERDAM, *with Dordrecht, Schiedam, and surrounding places, also Zeeland* ... ... *Ship Surveyors* ... ... — *R. Leeuwenburg, *A. Schouwenaar

Ship and Engineer Surveyors (Office, Veerhaven, W.Z. 19b, Rotterdam) — *F. N. Bernoski, *J. J. Schoo (TELEGRAMS, *Lloyd's Register*)

*Exclusively Officers of Lloyd's Register.

BELGIUM.

ANTWERP, *including all places in Belgium, and the Dutch Port Terneuzen* ... ... — *T. W. Fish, *Principal Surveyor*

Ship Surveyor ... ... *Ship and Engineer Surveyors* (Office, Maritime Buildings, Quai Taverniers, 4, Antwerp) — *N. E. McClelland, *A. E. Farminer, *J. E. J. Wilvers (TELEGRAMS, *Register*)

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FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

FRANCE.

BORDEAUX — *Ship Surveyor* … … … Albert Vandercruyce
Engineer Surveyor … … Arthur Donzelle
(Office, 16, rue Esprit des Lois) (TELEGRAMS FOR THE SURVEYORS, *Vandercruyce*, 16, *rue Esprit des Lois*)

DUNKIRK, *with Calais* … … … … …
Ship and Engineer Surveyor — F. C. Morel
(Office, rue des Pierres No. 22, Dunkirk) (TELEGRAMS, *Morel, Lloyd's*)

HÂVRE, *with a District including Boulogne, Barfleur, and Rouen*
Ship Surveyor … … … *M. G. Boyer
Engineer Surveyor and Assistant Ship Surveyor … *A. Cartier
(Office, 61, rue de la Bourse, Hâvre) (TELEGRAMS, *Lloyd's Register*)
*Exclusively Officers of Lloyd's Register

MARSEILLES — *Ship and Engineer Surveyor* — *A. P. Jones
(Office, 16, rue Beauvau)
* Exclusively an Officer of Lloyd's Register.

NANTES — *Ship and Engineer Surveyor* — William Kerr
(Office, 2, rue Racine) (TELEGRAMS, *Kerr, rue Racine*)

SPAIN AND PORTUGAL.

BARCELONA — *Ship and Engineer Surveyor* — G. E. A. Muston
(Office, Calle de Mallorca 259) (TELEGRAMS, *Muston, Mallorca* 259)

BILBAO — *Ship and Engineer Surveyors* — *J. Pollock, *I. de Mutiozabal
(Office, Aurora Building, Calle de la Estacion, 5) (TELEGRAMS, *Register*)
* Exclusively Officers of Lloyd's Register.

CADIZ — *Ship and Engineer Surveyor* — William West
(Address, Isaac Peral, 8) (TELEGRAMS, *West*)

LISBON — *Ship and Engineer Surveyor* — George Payne
(Address, 7, T. do Caes do Tojo) (TELEGRAMS, *Enyap*)

SEVILLE — *Ship and Engineer Surveyor* — José Pina
(Office, Laraña, 12) (TELEGRAMS, *Pina*)

GIBRALTAR.

GIBRALTAR — *Ship and Engineer Surveyor* — W. H. Beckett
(Address, H.M. Naval Yard) (TELEGRAMS, *Yard*)

ITALY.

GENOA — *Ship and Engineer Surveyor* — *Maurice Ritson
Ship Surveyor … … … *R. Stanley Rowntree
(Office, Piazza S. Giorgio No. 32, 1ª Scala) (TELEGRAMS, *Surveyors*)
*Exclusively Officers of Lloyd's Register.

LEGHORN … … … … … … … … … Amerigo Gori
(Address, Piazza Micheli) (TELEGRAMS, *A. Gori*)

NAPLES, *with Messina and other Ports in Sicily* … … … … …
Ship and Engineer Surveyor — Francesco Ducoster
(Torre Annunziata, near Naples; also at Viale Elena, No. 16, Naples) (TELEGRAMS, *Ducoster, Torre Annunziata*)

AUSTRIA-HUNGARY.

FIUME, *with the coast South of Pola, and the Dalmatian Islands*
Ship Surveyor … … Arturo Duimich
Engineer Surveyor … … Matteo Petrich
(Office, Governo Marittimo, Fiume) (TELEGRAMS FOR THE SURVEYORS, *Duimich, Porto, Fiume*)

AUSTRIA-HUNGARY—*continued.*

TRIESTE, *with Pola and the coast North of Pola; also Venice* … …
Ship Surveyor … … *Bernard J. Ives
Ship and Engineer Surveyor *G. D. Ritchie
(Office, Via San Giorgio, No. 5, Trieste) (TELEGRAMS, *Lloydregister, Sangiorgio, Trieste*)
*Exclusively Officers of Lloyd's Register

VIENNA — *Ship and Engineer Surveyors for Steel Testing duties and Inspection of Forgings, &c., in Austria-Hungary and Upper Silesia* … … … *M. Koch, *J. Rolland
(Address, Schelleingasse 52^{IX}, Vienna $^{IV}/_{2}$) (TELEGRAMS, *Surveyor*)
*Exclusively Officers of Lloyd's Register.

MALTA.

MALTA — *Ship and Engineer Surveyor* — C. H. Wright
(Office, 21, Strada Zaccaria, Valetta.) (TELEGRAMS, *Register*)

GREECE, TURKEY, AND ROUMANIA.

CONSTANTINOPLE, *including the Bosphorus, Sea of Marmora, and the Dardanelles* … … …
Ship and Engineer Surveyor — *Newman Mumford
(Office, Ferménédjiler Yeni-Han, Galata; Postal Address, P.O. 27, c/o British Post Office) (TELEGRAMS, *Mumford, Yeni-Han, Galata*)
* Exclusively an Officer of Lloyd's Register.

GALATZ AND BRAILA — *with a District extending as far as the mouth of the Danube and including Sulina* … … … … — T. H. Archbold
(residing at Braila) (TELEGRAMS, *Archbold, Braila*)

PIRÆUS — *Ship and Engineer Surveyor* — *W. W. Barnes (TELEGRAMS, *Barnes*)
* Exclusively an Officer of Lloyd's Register.

SYRA — *Ship and Engineer Surveyor* — Edward Eyssartier (TELEGRAMS *Eyssartier*)

CANADA.

PRINCIPAL SURVEYOR FOR THE UNITED STATES AND CANADA … … … … … — *James H. Mancor
(Office, 17, Battery Place, New York) (TELEGRAMS, *Nymdible*)
*Exclusively an Officer of Lloyd's Register.

HALIFAX, N.S. *Ship and Engineer Surveyor* — John L. G. Cooke
(Address, Room 37, Furness Withy Building) (TELEGRAMS, *Lloyd*)

MONTREAL … (Address, Port Warden's Office) Archibald Reid (TELEGRAMS, *Portwarden*)

PRINCE EDWARD ISLAND … … … … — H. P. Welsh
(Office, 296, Grafton Street, Charlottetown) (TELEGRAMS, *Register, Charlottetown*)

QUEBEC, *and the River St. Lawrence* …
Ship and Engineer Surveyor — Joseph Samson
(Office, 40, Dalhousie Street) (TELEGRAMS, *Samson*)

ST. JOHN, N.B. *Ship and Engineer Surveyor* C. E. Dalton (TELEGRAMS, *Dalton*)

FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

CANADA—*continued.*

TORONTO, ONT., *with a district including Lake Ontario and Collingwood, Ont.* ... ... *Ship and Engineer Surveyor* (Residing at Barrie, Ont.) — Hugh Calderwood

VANCOUVER CITY, B.C. *including Victoria, Vancouver Island, and all Ports in British Columbia* ... *Ship and Engineer Surveyor* (Office, 426, Winch Building, Hastings Street, (P.O. Box 642), Vancouver City) — T. G. Mitchell (TELEGRAMS, *Register, Vancouver B.C.*)

NEWFOUNDLAND.

ST. JOHN'S *Ship and Engineer Surveyor* (Office, Fisheries and Marine Department, Custom House) — *J. Black (TELEGRAMS, *Surveyor*)

* Exclusively an Officer of Lloyd's Register.

UNITED STATES OF AMERICA.

NEW YORK *Principal Surveyor for the United States and Canada* — *James H. Mancor

Ship Surveyor ... ... — *H. C. Farrar

Ship and Engineer Surveyors — *A. W. Murray, *J. S. Blackett, *E. Bennett, *F. W. Dawkins (TELEGRAMS, *Nymdible*)

(Office, 17, Battery Place, New York.)

* Exclusively Officers of Lloyd's Register.

BALTIMORE, MD. *Ship and Engineer Surveyor* — *H. A. Stewart

Ship Surveyor ... ... — *A. Allen

(Office, Stewart Building, South Gay Street) (TELEGRAMS, *Surveyor*)

* Exclusively Officers of Lloyd's Register.

BOSTON, MASS. *Ship and Engineer Surveyor* (Office, Fiske Building, 89, State Street) — *B. Stewart Murphy (TELEGRAMS, *Register*)

* Exclusively an Officer of Lloyd's Register.

CLEVELAND, OHIO *Ship Surveyor* ... ... (Office, 1517, Rockefeller Building) — *James French (TELEGRAMS, *Lloyds*)

Engineer Surveyor for Cleveland District ... ... (residing at Pittsburg, Pa.) — *J. S. Heck

* Exclusively Officers of Lloyd's Register.

GALVESTON, TEXAS *Ship and Engineer Surveyor* — *C. J. M. Mancor

* Exclusively an Officer of Lloyd's Register.

NEW ORLEANS, LA. *Ship and Engineer Surveyor* (Office, 810, Hennen Building) — *J. M. Buchanan (TELEGRAMS, *Retsiger*)

* Exclusively an Officer of Lloyd's Register.

NEWPORT NEWS, VA. *Ship and Engineer Surveyor* (Office, 2711, Washington Avenue) — *J. H. W. Marsden (TELEGRAMS, *Marsden*)

* Exclusively an Officer of Lloyd's Register.

PHILADELPHIA, PA. *Ship and Engineer Surveyor* — *R. Haig

Ship Surveyor ... ... — *D. Millar

(Office, 324, Bourse) (TELEGRAMS, *Haig*)

* Exclusively Officers of Lloyd's Register.

UNITED STATES OF AMERICA—*continued.*

PITTSBURG, PA. *Ship and Engineer Surveyor for Steel Testing Duties* ... (Office, 5,630, Rural Street) — *J. S. Heck

* Exclusively an Officer of Lloyd's Register

PORTLAND, OREGON, *including both shores of the Columbia River and all Ports in Oregon* ... ... (Office, Room 208, Commercial Club Building, Fifth and Oak Streets) — Lyddon Veysey (TELEGRAMS, *Register*)

SAN FRANCISCO, CAL. *Ship Surveyor* ... ... — John Metcalfe

Engineer Surveyor ... ... — W. H. Stewart

(Office, 454, California Street) (TELEGRAMS, *Freeboard*)

SEATTLE, WASH., *with Tacoma, Port Townsend and all Ports in Washington Territory; not including the Washington shore of the Columbia River*

Ship and Engineer Surveyor (Office, 503, Maynard Building, First Avenue, Corner Washington Street, Seattle) — James Fowler (TELEGRAMS, *Lloyds*)

MEXICO.

VERA CRUZ *Ship and Engineer Surveyor* (Office, Naval Military College) — G. Howard (TELEGRAMS, *Inamecon*)

BRITISH WEST INDIES.

TRINIDAD ... ... — J. B. Saunders (TELEGRAMS, *Harbour Master*)

DANISH WEST INDIES.

ST. THOMAS ... ... — T. V. C. Kruse (TELEGRAMS, *Kruse*)

SOUTH AMERICA.

BAHIA BLANCA *Ship and Engineer Surveyor* (Address, La Usina Electrica, Calle Donado) — J. H. Brewer (TELEGRAMS, *Brewer, c/o Bumodus*)

BUENOS AYRES AND ROSARIO, *Ship and Engineer Surveyors* (Office, Calle San Martin, 264, Buenos Ayres) — *P. I. Adie, *J. C. G. Williamson, *A. Moffat (TELEGRAMS, *Adie*)

* Exclusively Officers of Lloyd's Register.

DEMERARA (Address, Harbour Master's Office, 15, Water Street, Georgetown) — L. H. J. Tinney (TELEGRAMS, *Heliostat*)

MANAOS *Ship and Engineer Surveyor* (Address, Caixa do Correio, No. 100) — Bruce Thompson (TELEGRAMS, *Bruce*)

MONTE VIDEO ... ... (Address, Calle Zabala, 69) — J. W. Postlethwaite (TELEGRAMS, *Amphyl*)

PARA *Ship and Engineer Surveyor*

PUNTA ARENAS, CHILI *Ship and Engineer Surveyor* (Address, Apostadero Naval) — J. Dickson (TELEGRAMS, *Maestranza*)

RIO DE JANEIRO *Ship and Engineer Surveyor* (Address, Caixa 636) — Robert Vance (TELEGRAMS, *Register*)

TALCAHUANO ... ...

VALPARAISO *Ship and Engineer Surveyor* (Address, Casilla 934) — A. F. Smith (TELEGRAMS, *Smith, Pacific, Valparaiso*)

EGYPT AND RED SEA.

ADEN *Ship and Engineer Surveyor* (Address, Hedjuff) — T. W. Twaddle (TELEGRAMS, *Twaddle*)

ALEXANDRIA *Ship and Engineer Surveyor* (Address, The Arsenal) — J. E. Roberts (TELEGRAMS, *Roberts*)

FOREIGN AND COLONIAL SURVEYORSHIPS—*continued.*

SOUTH AFRICA.

CAPE TOWN	(Address, Dock Office)	W. Stephen (TELEGRAMS, *Navigation*)
EAST LONDON	(Address, The Shipping Office)	William Hildyard (TELEGRAMS, *Register*)
PORT ELIZABETH	*Ship and Engineer Surveyor* (Address, Harbour Works)	H. McG. Richardson (TELEGRAMS, *Richardson, Harbour, Port Elizabeth*)
PORT NATAL	(Address, 3, Castle Buildings, Durban)	Frederick Airth (TELEGRAMS, *Airth, Durban*)

MAURITIUS.

MAURITIUS	(residing at Port Louis) ...	M. S. McDonald (TELEGRAMS, *McDonald, Port Louis, Mauritius*)

INDIA, CEYLON, BURMAH, SIAM, AND STRAITS SETTLEMENTS.

BANGKOK	*Ship and Engineer Surveyor*	
BOMBAY	*Ship and Engineer Surveyor* (Office, Gool Mansions, Wellington Lines, Mayo Road)	*A. T. Graham (TELEGRAMS, *Surveyor*)

* Exclusively an Officer of Lloyd's Register.

CALCUTTA	*Ship and Engineer Surveyor* (Office, 2, Hare Street)	*J. H. Mackirdy (TELEGRAMS, *Freeboards*)

* Exclusively an Officer of Lloyd's Register.

COLOMBO	*Ship and Engineer Surveyor*	H. B. Ratsey (TELEGRAMS *Ratsey*)
KARACHI	*Ship and Engineer Surveyor* (Address, Persian Gulf Telegraphs, Manora, Karachi)	F. H. Jones
PENANG	*Ship and Engineer Surveyor*	H. Muir (TELEGRAMS, *Muir*)
RANGOON	(Address, Lower Poozoondoung)	R. P. Taylor (TELEGRAMS, *Orion*)
SINGAPORE	*Ship and Engineer Surveyor* (Office, 6A, Flint Street)	*Andrew Couper (TELEGRAMS, *Couper*)

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EAST INDIAN ARCHIPELAGO.

BATAVIA	... ...	H. van Taalingen (TELEGRAMS, *Taalingen*)
MANILA, P.I., *and Ports in the Philippine Islands*	... *Ship and Engineer Surveyor* (Address, Anloague No. 10, Binondo; P.O. Box 307)	William Swann (TELEGRAMS, *Turbine*)
SOURABAYA	*Ship and Engineer Surveyor*	B. N. Powell (TELEGRAMS, *Powell*)

HONG KONG.

HONG KONG	*Ship and Engineer Surveyor* (Office, 5, Alexandra Buildings; P.O. Box 463)	*John Lambert (TELEGRAMS, *Marine*)

* Exclusively an Officer of Lloyd's Register.

CHINA.

SHANGHAI	*Ship and Engineer Surveyor* (Address, 13, Nanking Road)	*J. S. Cairns (TELEGRAMS, *Register*)

* Exclusively an Officer of Lloyd's Register.

TIENTSIN	*Ship and Engineer Surveyor* (Address, Victoria Road)	W. Wilson (TELEGRAMS, *Dumbarton*)

JAPAN.

KOBÉ	*Ship and Engineer Surveyor* (Office, 16A, Harima Machi)	*A. L. Jones (TELEGRAMS, *Register*)

* Exclusively an Officer of Lloyd's Register.

NAGASAKI	*Ship and Engineer Surveyor* / *Ship Surveyor* ... ... (Office, 42c, Sagarimatsu)	*A. C. Heron / *G. D. Aitken (TELEGRAMS, *Register*)

* Exclusively Officers of Lloyd's Register.

YOKOHAMA	*Ship and Engineer Surveyor* (Office, 23, Water Street; P.O. Box 48)	*A. S. Williamson (TELEGRAMS, *Register*)

* Exclusively an Officer of Lloyd's Register.

HAKODATE	*Assistant Ship and Engineer Surveyor* ... ... (Address, 43, Ohmachi)	Gosaku Horiuchi (TELEGRAMS, *Horiuchi, Ohmachi, Hakodate*)

AUSTRALIA AND NEW ZEALAND.

ADELAIDE, S. A.	(Office, Lipson Street, Port Adelaide)	J. H. Gibbon (TELEGRAMS, *Gibbon*)
AUCKLAND, N.Z.	... ...	M. T. Clayton (TELEGRAMS, *Replento*)
BRISBANE, QUEENSLAND	... ... (Office, Parbury's Buildings, Eagle Street)	R. S. Taylor (TELEGRAMS, *Surveyor*)
*CHRISTCHURCH & LYTTELTON, N.Z.		
DUNEDIN, N.Z.	*Ship and Engineer Surveyor* (Address, 123, High Street)	A. Morrison (TELEGRAMS, *Cellular*)
FREMANTLE, W.A.	... ... (Address, Dalgety's Buildings, Cliff Street)	R. E. Arundel (TELEGRAMS, *Arundel*)
MELBOURNE, VICTORIA	*Ship and Engineer Surveyor* (Office, New Zealand Chambers, 483, Collins Street)	Alexander McCowan (TELEGRAMS, *Reports*)
NAPIER, N.Z.	... ...	John C. Tonkin (TELEGRAMS, *Tonkin, Surveyor*)
NEWCASTLE, N.S.W.	*Ship Surveyor* ... (Office, Carrington Chambers, Watt Street)	J. W. Vellacott (TELEGRAMS, *Backstay*)
	Engineer Surveyor ... ... (Office, 1, Bolton Street)	F. A. Spence (TELEGRAMS, *Spence, c/o Barambio*)
PORT PIRIE, S.A., *with Port Germein and Wallaroo*	... ... (Address, Institute Building, Alexandra Street, Port Pirie)	Alfred M. Mars (TELEGRAMS, *Mars*)
SYDNEY, N.S.W.	*Ship and Engineer Surveyor* (Office, 17, Bridge Street)	*R. Pollock (TELEGRAMS, *Miramar*)

* Exclusively Officers of Lloyd's Register.

TIMARU, N.Z.	... ...	James Tait
WELLINGTON, N.Z.	... ...	

71, *Fenchurch Street, London,*
1st January, 1912.

LIST OF SURVEYORSHIPS OF LLOYD'S REGISTER.

(ALPHABETICALLY ARRANGED.)

THE SURVEYORS AT THE PORTS MARKED * ARE EXCLUSIVELY THE OFFICERS OF THE SOCIETY, AND ARE NOT PERMITTED TO ENGAGE IN ANY OTHER BUSINESS OR EMPLOYMENT WHATSOEVER.

***LONDON** (TELEGRAMS *Committee*)

S. J. P. THEARLE, D.Sc., *Chief Ship Surveyor of Lloyd's Register.*

Assistants to Chief Ship Surveyor:
C. BUCHANAN
E. C. CHAMPNESS
C. FOWLING

Principal Surveyors on the Chief Ship Surveyor's Staff:
G. R. Mares | T. S. Warren

JAMES T. MILTON, M.INST.C.E., *Chief Engineer Surveyor of Lloyd's Register.*

Assistant to Chief Engineer Surveyor:
H. A. RUCK-KEENE, M.INST.C.E.

A. Campbell Holms, *Principal Surveyor for London District.*

Ship Surveyors:
D. Nicholas
R. Howie
G. F. Robson
W. H. Watson
R. B. Watt
J. W. Grier
J. Montgomerie, B.Sc.
C. C. Gearing
R. D. Cairns
J. F. Isherwood
A. Chisholm, B.Sc.
H. J. Cox
W. Thomson, B.Sc.
R. J. L. Ward, B.Sc.

Ship and Engineer Surveyors:
R. Balfour
T. R. Blackie
J. W. Dimmock
H. H. Ashton
H. P. Cornish
J. B. A. Common
J. E. Milton
E. J. Stoddart
H. G. Dearden
C. R. Hughes
J. Robinson
A. A. A. Chalmers
A. Lawrance, B.Sc.
H. L. Fletcher

Draughtsman ... ... David S. Hunter

*ABERDEEN	*Ship and Engineer Surveyor* *Ship Surveyor* ... ... (Office, 18½, Regent Quay)	R. Fowell J. Dickie
ADELAIDE, S.A.	(Office, Lipson Street, Port Adelaide)	J. H. Gibbon (TELEGRAMS, *Gibbon*)
ADEN	*Ship and Engineer Surveyor* (Address, Hedjuff)	T. W. Twaddle (TELEGRAMS, *Twaddle*)
ALEXANDRIA, EGYPT	*Ship and Engineer Surveyor* (Address, The Arsenal)	J. E. Roberts (TELEGRAMS, *Roberts*)
*AMSTERDAM	*Ship and Engineer Surveyors* (Office, Binnenkant, No. 27)	J. B. Slebe H. P. Burgdorffer (TELEGRAMS, *Lloyd's Register*)
*ANTWERP	... ... *Ship Surveyor* ... ... *Ship and Engineer Surveyors* (Office, Maritime Buildings, Quai Taverniers, 4)	T. W. Fish, *Principal Surveyor* N. E. McClelland A. E. Farminer J. E. J. Wilvers (TELEGRAMS, *Register*)
AUCKLAND, N.Z.	... ...	M. T. Clayton (TELEGRAMS, *Replento*)
BAHIA BLANCA	*Ship and Engineer Surveyor* (Address, La Usina Electrica, Calle Donado)	J. H. Brewer (TELEGRAMS, *Brewer, c/o Bumodus*)
*BALTIMORE, MD.	*Ship and Engineer Surveyor* ... ... *Ship Surveyor* ... ... (Office, Stewart Building, South Gay Street)	H. A. Stewart A. Allen (TELEGRAMS, *Surveyor*)
BANGKOK	*Ship and Engineer Surveyor*	
BARCELONA	*Ship and Engineer Surveyor* (Office, Calle de Mallorca 259)	G. E. A. Muston (TELEGRAMS, *Muston, Mallorca 259*)
*BARROW	*Ship and Engineer Surveyor* (Office, Ramsden Square)	J. Easthope
*BARRY	*Ship and Engineer Surveyors* (Office, Dock Chambers, Barry Dock) *Ship Surveyor*	Wm. J. Darling J. G. Mackillop G O. Common H. C. T. Ireland
BATAVIA	... ...	H. van Taalingen (TELEGRAMS, *Taalingen*)
*BELFAST	*Ship and Engineer Surveyors* *Ship Surveyors* ... ... (Office, 97 & 98, Scottish Provident Institution Buildings, Donegall Square West)	R. J. Beveridge A. T. Thomas S. O. Kendall J. McIlvenna
BERGEN	*Ship and Engineer Surveyor*	S. A. Eide (TELEGRAMS, *Surveyor*)
*BIDEFORD	(Address, Odun Road, Appledore, Devon)	J. Hand
*BILBAO	*Ship and Engineer Surveyors* (Office, Aurora Building, Calle de la Estacion, 5)	J. Pollock I. de Mutiozabal (TELEGRAMS, *Register*)
*BOMBAY	*Ship and Engineer Surveyor* (Office, Gool Mansions, Wellington Lines, Mayo Road)	A. T. Graham (TELEGRAMS, *Surveyor*)
BORDEAUX	*Ship Surveyor* ... ... *Engineer Surveyor* ... ... (Office, 16, rue Esprit des Lois)	Albert Vandercruyce Arthur Donzelle (TELEGRAMS FOR THE SURVEYORS, *Vandercruyce*, 16, *rue Esprit des Lois*)
*BOSTON, MASS.	*Ship and Engineer Surveyor* (Office, Fiske Building, 89, State Street)	B. Stewart Murphy (TELEGRAMS, *Register*)
BRAILA AND GALATZ	(residing at Braila)...	T. H. Archbold (TELEGRAMS, *Archbold*)
*BREMEN	*Ship and Engineer Surveyor* (Office, Rolandhaus)	G. H. C. Bahr (TELEGRAMS, *Bahr, Rolandhaus*)
BRISBANE, QUEENSLAND	(Office, Parbury's Buildings, Eagle Street)	R. S. Taylor (TELEGRAMS, *Surveyor*)

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

Port	Office	Surveyor(s)
*BRISTOL	*Ship and Engineer Surveyor* (Office, 53, Queen Square)	G. A. D. Toyne
*BUENOS AYRES AND ROSARIO	*Ship and Engineer Surveyors* (Office, Calle San Martin, 264, Buenos Ayres)	P. I. Adie J. C. G. Williamson A. Moffat (TELEGRAMS, *Adie*)
CADIZ	*Ship and Engineer Surveyor* (Address, Isaac Peral, 8)	William West (TELEGRAMS, *West*)
*CALCUTTA	*Ship and Engineer Surveyor* (Office, 2, Hare Street)	J. H. Mackirdy (TELEGRAMS, *Freeboards*)
CAPE TOWN	(Address, Dock Office)	W. Stephen (TELEGRAMS, *Navigation*)
*CARDIFF	... ...	Henry Hand *Principal Surveyor*
	Ship Surveyors ... ... (Office, Merchants' Exchange, Bute Docks)	J. Petree A. B. R. Harris E. I. Evans (TELEGRAMS, *Register*)
	Ship and Engineer Surveyors	James Barclay J. G. Hunter F. W. Webb W. Lane J. F. Robson
*CHANNEL ISLANDS	(Office, 15, Mulcaster Street, St. Helier's, Jersey)	J. F. Picot
*CHRISTCHURCH & LYTTELTON, N.Z.		
CHRISTIANIA	*Ship and Engineer Surveyor*	
*CLEVELAND, OHIO	*Ship Surveyor...* ... ... (Office, 1,517, Rockefeller Building)	James French (TELEGRAMS, *Lloyds*)
	Engineer Surveyor for Cleveland District ... ... (residing at Pittsburg, Pa.)	J. S. Heck
COLLINGWOOD, ONT.	(*See* TORONTO, ONT.)	
COLOMBO	*Ship and Engineer Surveyor*	H. B. Ratsey (TELEGRAMS, *Ratsey*)
*CONSTANTINOPLE	*Ship and Engineer Surveyor* (Office, Ferménédjiler, Yeni-Han, Galata; Postal Address, P.O. 27, c/o British Post Office)	Newman Mumford (TELEGRAMS, *Mumford Yeni-Han, Galata*)
*COPENHAGEN	*Ship and Engineer Surveyors* (Office, Amaliegade, 36¹, Copenhagen, K.)	H. J. Sonne A. F. Örbech A. T. Poulsen
	Ship Surveyor...	J. A. A. C. von Rosen (TELEGRAMS, *Engineer*)
DANZIG	*Ship and Engineer Surveyor* (Address, Pommersche Strasse, 38, Zoppot, near Danzig)	Carl Schirnick
*DARLINGTON	*Inspector of Forgings* ... (Office, 9, Granville Terrace)	F. Cook
DEMERARA	(Address, Harbour Master's Office, 15, Water Street, Georgetown)	L. H. J. Tinney (TELEGRAMS, *Heliostat*)
DOVER	... ...	John Iron (TELEGRAMS, *Harbour Master*)
*DUBLIN	*Ship and Engineer Surveyor* (Office, 115, Philipsburgh Avenue)	J. Macwilliam (TELEGRAMS, *Macwilliam, 115, Philipsburgh Avenue*)
*DUNDEE	*Ship and Engineer Surveyor* *Ship Surveyor...* ... ... (Office, Maritime Buildings, East Dock Street)	E. M. Salmon M. Blackwood
DUNEDIN, N.Z.	*Ship and Engineer Surveyor* (Address, 123, High Street)	A. Morrison (TELEGRAMS, *Cellular*)
DUNKIRK	*Ship and Engineer Surveyor* (Office, rue des Pierres, No. 22)	F. C. Morel (TELEGRAMS, *Morel, Lloyd's*)
*DÜSSELDORF	*Ship and Engineer Surveyors for Steel Testing duties and Inspection of Forgings, &c., in Germany* ... ... (Office, Herderstrasse 70, Düsseldorf, 109)	J. Meijer K. Hauss P. F. J. Abel Hans Kolbow M. Berg (TELEGRAMS, *Meijer, Herderstrasse, 70*)
EAST LONDON, S. AFRICA	(Address, The Shipping Office)	William Hildyard (TELEGRAMS, *Register*)
*FALMOUTH	*Ship Surveyor...* ... ... (Office, Pendennis House, Lansdowne Road)	T. H. Sandry
	Ship and Engineer Surveyor	F. Davis
FIUME	*Ship Surveyor...* ... ... *Engineer Surveyor* ... ... (Office, Governo Marittimo)	Arturo Duimich Matteo Petrich (TELEGRAMS FOR THE SURVEYORS, *Duimich, Porto, Fiume*)
FREMANTLE, W.A.	... ... (Address, Dalgety's Buildings, Cliff Street)	R. E. Arundel (TELEGRAMS, *Arundel*)
GALATZ	(*See* BRAILA)	
*GALVESTON, TEXAS	*Ship and Engineer Surveyor*	C. J. M. Mancor
*GENOA	*Ship and Engineer Surveyor* *Ship Surveyor...* ... ... (Office, Piazza S. Giorgio, No. 32, 1ª Scala)	Maurice Ritson R. Stanley Rowntree (TELEGRAMS, *Surveyors*)
GIBRALTAR	*Ship and Engineer Surveyor* (Address, H.M. Naval Yard)	W. H. Beckett (TELEGRAMS, *Yard*)
*GLASGOW	*Ship Surveyors* ... ... (Office, 342, Argyle Street) (TELEGRAMS, *Register*)	T. J. Dodd *Principal Surveyor* J. D. Mares R. Wright G. M. Shaw W. S. P. Collings H. A. Gibbs W. Watt G. Nicol W. A. Grier A. Scullard A. Pickworth, B.Sc. J. S. Gardiner

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

*GLASGOW (*Cont.*)	*Ship and Engineer Surveyors*	John H. Heck H. Clarke A. McKeand P. McGregor H. Gardner-Smith W. G. Minchin C. H. L. Pilditch H. C. Forster P. T. Brown A. Smellie G. E. Bench T. W. C. Napier J. Davey F. A. Ferguson J. Blellock
	Inspectors of Forgings for the Clyde District	A. Fletcher Jervis Dale
*GOTHENBURG	*Ship and Engineer Surveyors* (Office, Hertzia, Packhusplatsen, 2)	V. C. Bülow G. W. Jörgensen (TELEGRAMS, *Surveyor*)
*GREENOCK & PORT GLASGOW	*Ship Surveyors* (Office, Commercial Bank Buildings, 14, Cross-shore Street, Greenock)	E. J. Tierney *Principal Surveyor* J. Craig R. Bennett A. P. W. McNab
	Ship and Engineer Surveyors	W. R. Austin J. Harbottle
*GRIMSBY & BOSTON	*Ship and Engineer Surveyors*	C. Martell W. H. Roberts
	Ship Surveyor ... ... (Office, Bank Chambers, 2, Freeman St., Great Grimsby)	R. Cheetham
HAKODATE	(*See* YOKOHAMA.)	
HALIFAX, N.S.	*Ship and Engineer Surveyor* (Address, Room 37, Furness Withy Building)	John L. G. Cooke (TELEGRAMS, *Lloyd*)
*HAMBURG	*Ship Surveyors* ... ... (Office, Steinhöft, No. 3, Hamburg, 11)	Geo. Dykes C. H. F. Preiss (TELEGRAMS, *Dykes, Steinhöft*)
	Engineer Surveyor ... ... (Office, Steinhöft No. 3, Hamburg, 11)	†M. Berendt (TELEGRAMS, *Ingbert*)
	Assistant Engineer Surveyor	†J. Köhler

† Not exclusively Officers of Lloyd's Register.

*HARTLEPOOL AND WEST HARTLEPOOL.	*Ship Surveyors* ... ... (Office, Central Buildings, West Hartlepool)	D. McAuslan *Principal Surveyor* O. Narbeth W. M. Ward
	Ship and Engineer Surveyors	James Innes A. Boyd C. O. Craven
*HÂVRE	*Ship Surveyor*	M. G. Boyer
	Engineer Surveyor and Assistant Ship Surveyor (Office, 61, rue de la Bourse)	A. Cartier (TELEGRAMS, *Lloyd's Register*)
*HONG KONG	*Ship and Engineer Surveyor* (Office, 5, Alexandra Buildings; P.O. Box, 463)	John Lambert (TELEGRAMS, *Marine*)
*HULL	*Ship Surveyors* ... ... (Office, Ocean Chambers, Lowgate, Hull)	A. B. Wilson *Principal Surveyor* F. C. Smith
	Ship and Engineer Surveyors	F. L. Sturgeon J. W. Gwynne T. G. Dodd
KARACHI	*Ship and Engineer Surveyor* (Address, Persian Gulf Telegraphs, Manora, Karachi)	F. H. Jones
*KOBÉ	*Ship and Engineer Surveyor* (Office, 16A, Harima Machi)	A. L. Jones (TELEGRAMS, *Register*)
LEGHORN	(Address, Piazza Micheli) ...	Amerigo Gori (TELEGRAMS, *A. Gori*)
*LEITH	*Ship and Engineer Surveyors* (Office, Royal Bank Buildings, 28, Constitution Street)	G. A. Hake W. D. Heck, B.Sc.
	Ship Surveyor	J. R. Henderson
LISBON	*Ship and Engineer Surveyor* (Address 7, T. do Caes do Tojo)	George Payne (TELEGRAMS, *Enyap*)
*LIVERPOOL	*Ship Surveyors* ... ... (Office, 201, Tower Building) (TELEGRAMS, *Register*)	R. Williamson *Principal Surveyor* J. Bradley S. A. G. Nash W. R. M. Aspinall W. G. Haig
	Ship and Engineer Surveyors	J. Dykes W. Sibun B. G. Oxford J. Carnaghan R. D. Shilston A. J. Barrett W. G. McKinlay
*LYTTELTON, N.Z.	(*See* CHRISTCHURCH.)	
MALTA	*Ship and Engineer Surveyor* (Office, 21, Strada Zaccaria, Valetta)	C. H. Wright (TELEGRAMS, *Register*)
MANAOS	*Ship and Engineer Surveyor* (Address, Caixa do Correio, No. 100)	Bruce Thompson (TELEGRAMS, *Bruce*)
*MANCHESTER	*Ship and Engineer Surveyors* (Office, 162, Trafford Road, Salford, Manchester)	F. W. Pitt S. N. Kent (TELEGRAMS, *Lloyd's Register, Trafford Road, Salford*)
MANILA, P.I.	*Ship and Engineer Surveyor* (Address, Anloague No. 10, Binondo; P.O. Box 307)	William Swann (TELEGRAMS, *Turbine*)
*MARSEILLES	*Ship and Engineer Surveyor* (Office, 16, rue Beauvau)	A. P. Jones
MAURITIUS	(residing at Port Louis) ...	M. S. McDonald (TELEGRAMS, *McDonald, Port Louis, Mauritius*)
MELBOURNE, VICTORIA	*Ship and Engineer Surveyor* (Office, New Zealand Chambers, 483, Collins Street)	Alexander McCowan (TELEGRAMS, *Reports*)
MESSINA, *and other ports in Sicily.*	(*See* NAPLES.)	
*MIDDLESBROUGH	*with Stockton* ... ... *Ship Surveyors* ... ... (Office, Royal Exchange, Middlesbrough)	W. L. Gilmour *Principal Surveyor* T. G. Baker J. R. Dippie J. W. Stuart N. G. Turnbull
	Ship and Engineer Surveyors	W. Morrison J. Kerr A. L. Whittell D. M. Chapman G. F. Silley
MILFORD HAVEN	*Ship and Engineer Surveyor* (Address, Point House, Llanstadwell, Neyland)	J. W. Johnstone
MONTE VIDEO.	... ... (Address, Calle Zabala, 69)	J. W. Postlethwaite (TELEGRAMS, *Amphyl*)

LIST OF SURVEYORSHIPS (ALPHABETICALLY ARRANGED)—*continued.*

MONTREAL (Address, PortWarden's Office) Archibald Reid (TELEGRAMS, *Portwarden*)

*NAGASAKI *Ship and Engineer Surveyor* A. C. Heron
Ship Surveyor... ... ... G. D. Aitken
(Office, 42c, Sagarimatsu) (TELEGRAMS, *Register*)

NANTES *Ship and Engineer Surveyor* William Kerr
(Office, 2, rue Racine) (TELEGRAMS, *Kerr, rue Racine*)

NAPIER, N.Z. ... ... John C. Tonkin (TELEGRAMS, *Tonkin, Surveyor*)

NAPLES *Ship and Engineer Surveyor* (Torre Annunziata, near Naples; also Viale Elena, No. 16, Naples) Francesco Ducoster (TELEGRAMS, *Ducoster, Torre Annunziata*)

*NEW ORLEANS, LA. *Ship and Engineer Surveyor* (Office, 810, Hennen Building) J. M. Buchanan (TELEGRAMS, *Retsiger*)

*NEW YORK *Principal Surveyor for the United States and Canada.* James H. Mancor
Ship Surveyor... ... ... H. C. Farrar
Ship and Engineer Surveyors (Office, 17, Battery Place)
A. W. Murray
J. S. Blackett
E. Bennett
F. W. Dawkins
(TELEGRAMS, *Nymdible*)

NEWCASTLE, N.S.W. *Ship Surveyor* ... ... J. W. Vellacott
(Office, Carrington Chambers, Watt Street) (TELEGRAMS, *Backstay*)
Engineer Surveyor ... ... F. A. Spence
(Office, 1, Bolton Street) (TELEGRAMS, *Spence, c/o Barambio*)

*NEWCASTLE-ON-TYNE *Ship Surveyors* ... ...
(Office, Collingwood Buildings, Collingwood Street)
(TELEGRAMS, *Register*)
George Harrison *Principal Surveyor*
E. J. Milton
A. R. Sneddon
A. Munro
G. L. Brown
T. Shaw
John Macdonald
L. G. G. Demarest
M. Macleod
B. C. Laws, B.Sc.
J. S. Butler
W. A. Brydon
J. A. Whitford
Ship and Engineer Surveyors
R. W. Coomber
C. Cooper
G. Murdoch
T. Field
L. G. Shallcross
C. J. Hudson
J. E. Sellex
R. Lee Annear, B.Sc.
J. Houston
W. Cowie
Inspector of Forgings ... William Campbell

*NEWFOUNDLAND. (*See* ST. JOHN'S, N.F.L.)

*NEWPORT, MON. *Ship and Engineer Surveyors* R. F. Morton
S. Townend
Ship Surveyor... ... ... (Office, Bank Chambers) R. Langlands

*NEWPORT NEWS, VA. *Ship and Engineer Surveyor* (Office, 2711, Washington Avenue) J. H. W. Marsden (TELEGRAMS, *Marsden*)

*ODESSA *Ship and Engineer Surveyor* (Office, Khersonskaya 54, Kv. 8) G. Robson

ORKNEYS (residing at Stromness) ... Geo. Gunn Baillie

PARA *Ship and Engineer Surveyor*

PENANG *Ship and Engineer Surveyor* H. Muir (TELEGRAMS, *Muir*)

*PHILADELPHIA PA. *Ship and Engineer Surveyor* R. Haig
Ship Surveyor... ... ... D. Millar
(Office, 324 Bourse) (TELEGRAMS, *Haig*)

*PIRÆUS *Ship and Engineer Surveyor* W. W. Barnes (TELEGRAMS, *Barnes*)

*PITTSBURG, PA. *Ship and Engineer Surveyor for Steel Testing duties...* (Office, 5,630, Rural Street) J. S. Heck

*PLYMOUTH *Ship and Engineer Surveyor* (Office, 13, Exchange) J. C. Larg

PORT ELIZABETH *Ship and Engineer Surveyor* (Address, Harbour Works) H. McG. Richardson (TELEGRAMS, *Richardson, Harbour, Port Elizabeth*)

PORT NATAL (Address, 3, Castle Buildings, Durban) Frederick Airth (TELEGRAMS, *Airth, Durban*)

PORT PIRIE, S.A. (Address, Institute Building, Alexandra Street) Alfred M. Mars (TELEGRAMS, *Mars*)

PORTLAND, OREGON (Office, Room 208, Commercial Club Building, Fifth and Oak Streets) Lyddon Veysey (TELEGRAMS, *Register*)

*PORTMADOC (Address, Eifion House, Portmadoc) John W. James

PRINCE EDWARD ISLAND (Office, 296, Grafton Street, Charlottetown) H. P. Welsh (TELEGRAMS, *Register, Charlottetown*)

PUNTA ARENAS, CHILI *Ship and Engineer Surveyor* (Address, Apostadero Naval) J. Dickson (TELEGRAMS, *Maestranza*)

QUEBEC *Ship and Engineer Surveyor* (Office, 40, Dalhousie Street) Joseph Samson (TELEGRAMS, *Samson*)

*QUEENSTOWN (Address, 1, Bellevue Terrace) H. W. Dove

RANGOON (Address, Lower Poozoondoung) R. P. Taylor (TELEGRAMS, *Orion*)

RIGA *Ship and Engineer Surveyor* (Address, Muckenholm Strasse No. 37) Eduard Buchholz (TELEGRAMS, *Surveyor*)

RIO DE JANEIRO *Ship and Engineer Surveyor* (Address, Caixa 636) Robert Vance (TELEGRAMS, *Register*)

*ROSARIO (*See* BUENOS AYRES.)

*ROTTERDAM *Ship Surveyors* ... ... R. Leeuwenburg
A. Schouwenaar
Ship and Engineer Surveyors (Office, Veerhaven, W.Z. 19 b.) F. N. Bernoski
J. J. Schoo
(TELEGRAMS *Lloyd's Register*)

ST. JOHN, N.B. *Ship and Engineer Surveyor* C. E. Dalton (TELEGRAMS, *Dalton*)

*ST. JOHN'S, N.F.L. *Ship and Engineer Surveyor* (Office, Fisheries and Marine Department, Custom House) J. Black (TELEGRAMS, *Surveyor*)

ST. THOMAS, D.W.I.... ... ... T. V. C. Kruse (TELEGRAMS, *Kruse*)

SAN FRANCISCO, CAL. *Ship Surveyor* ... ... John Metcalfe
Engineer Surveyor ... ... W. H. Stewart
(Office, 454, California Street) (TELEGRAMS, *Freeboard*)

LIST OF SURVEYORSHIPS (alphabetically arranged)—*continued.*

Seattle, Wash.	*Ship and Engineer Surveyor* (Office, 503, Maynard Building, First Avenue, Corner Washington Street)	James Fowler (Telegrams, *Lloyd's*)
Seville	*Ship and Engineer Surveyor* (Office, Laraña, 12)	José Pina (Telegrams, *Pina*)
*Shanghai	*Ship and Engineer Surveyor* (Address, 13, Nanking Road)	J. S. Cairns (Telegrams, *Register*)
*Sheffield	*Ship and Engineer Surveyor*	J. C. Turpin
	Inspector of Forgings ... (Office, Orchard Chambers, Church Street)	J. Pringle
*Singapore	*Ship and Engineer Surveyor* (Office, 6A, Flint Street)	Andrew Couper (Telegrams, *Couper*)
Sourabaya	*Ship and Engineer Surveyor*	B. N. Powell (Telegrams, *Powell*)
*Southampton	*Ship and Engineer Surveyors* (Office, 20, Canute Road)	R. Elliott, B.Sc., M.Inst.C.E. H. Gilby
	Ship Surveyor	G. O. Herbert
Stettin	*Ship and Engineer Surveyor* (Office, Bollwerk 1.)	Emil Herzberg (Telegrams, *Herzberg, Lloydssurveyor*)
Stockholm	*Ship and Engineer Surveyor* (Address, Drottgården, 14 & 16, Stadsgården)	Albert Isakson (Telegrams, *Lloyd's Register*)
*Sunderland	*Ship Surveyors* ... ... (Office, 55, Fawcett Street)	F. R. Noton *Principal Surveyor* J. Allan T. S. Leathard T. S. Shute R. M. McLaren
	Ship and Engineer Surveyors	J. T. Findlay W. Butler L. C. Davis
	Inspector of Forgings ...	M. Robertson
*Swansea	*Ship and Engineer Surveyors* (Office. Lancaster Chambers, 17, Wind Street)	G. C. Vaux A. Campbell T. Miller
*Sydney, N.S.W.	*Ship and Engineer Surveyor* (Office, 17, Bridge Street)	R. Pollock (Telegrams, *Miramar*)
Syra	*Ship and Engineer Surveyor*	Edward Eyssartier (Telegrams, *Eyssartier*)
Talcahuano	... ...	
Tientsin	*Ship and Engineer Surveyor* (Address, Victoria Road)	W. Wilson (Telegrams, *Dumbarton*)
Timaru, N.Z.	... ...	James Tait
Toronto, Ont.	*Ship and Engineer Surveyor* (Residing at Barrie, Ont.)	Hugh Calderwood
*Trieste	*Ship Surveyor*	Bernard J. Ives
	Ship and Engineer Surveyor (Office, Via San Giorgio, No. 5)	G. D. Ritchie (Telegrams, *Lloydregister, Sangiorgio*)
Trinidad ...	... ...	J. B. Saunders (Telegrams, *Harbour Master*)
Valparaiso	*Ship and Engineer Surveyor* (Address, Casilla, 934)	A. F. Smith (Telegrams, *Smith, Pacific, Valparaiso*)
Vancouver City, B.C.	*Ship and Engineer Surveyor* (Office, 426, Winch Building, Hastings Street; P.O. Box 642)	T. G. Mitchell (Telegrams, *Register Vancouver, B C.*)
Vera Cruz, Mexico.	*Ship and Engineer Surveyor* (Office, Naval Military College)	G. Howard (Telegrams, *Inamecon*)
*Vienna	*Ship and Engineer Surveyors for Steel Testing duties and Inspection of Forgings, &c., in Austria-Hungary and Upper Silesia* ... ... (Address, Schelleingasse, 52^IX, Vienna, ^IV/2)	M. Koch J. Rolland (Telegrams, *Surveyor*)
Waterford	*Ship and Engineer Surveyor*	Andrew Horn
Wellington, N.Z.	... ...	
*Yokohama	*Ship and Engineer Surveyor* (Office, 23, Water Street; P.O. Box 48)	A. S. Williamson (Telegrams, *Register*)
Hakodate	*Assistant Ship and Engineer Surveyor* (Address, 43, Ohmachi)	Gosaku Horiuchi (Telegrams, *Horiuchi Ohmachi, Hakodate*)

71, Fenchurch Street, London.
1st *January*, 1912.

LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

RULES AND REGULATIONS.

Section 1. THE operations of the Societies of the two Register Books of Shipping formerly printed for the use of Merchants, Ship Owners, and Underwriters, having ceased in the year 1834, this Society was then established for the purpose of obtaining a faithful and accurate Classification of the Mercantile Shipping of the United Kingdom, and of the Foreign Vessels trading thereto, and for the government of which the following Rules and Regulations have been from time to time adopted.

Section 2. A Register Book to be printed annually for the use of Subscribers, containing the names of the Ships with other useful information, and the Character assigned, where the vessels are classed by the Society ; also the names, &c., of all Ships of 100 tons and upwards unclassed by this Society.

Section 3. Each person subscribing the sum of Three Guineas per annum (or such other sum as the General Committee may fix) to be considered a Member of the Society, and entitled *for his own use* to one copy of the Register Book.

Section 4. The subscription of Marine Insurance Companies, Public Companies or Public Establishments to be Six Guineas per annum, for a single copy of the Register Book and £3 3s. per annum for every additional copy supplied, unless the copies be periodically posted with type with additions and corrections throughout the year, in which case the subscription for each copy supplied will be Ten guineas per annum.

Section 5. In the case of other Subscribers the subscription to be £3 3s. per annum for each copy, unless periodically posted with type with additions and corrections throughout the year, in which case the subscription will be £5 5s. per annum for each copy supplied.

Section 6. For the convenience of Subscribers not resident in London, or whose Register Books are not posted, a Supplement, containing the additions to, and corrections made in, the Register Book, to be printed fortnightly, in such convenient form as to admit of its transmission by Post, so that such parties may be furnished, from time to time, with the latest and most complete information.

Section 7. The superintendence of the affairs of the Society to be under the direction of a Committee of Merchants, Shipowners, and Underwriters: (twenty-four to be elected in London and thirty-six at the principal Outports), and ten Shipbuilders and/or Engineers (to be elected as a temporary arrangement for two years by the General Committee). In addition, the Chairman, or, in his absence, the Deputy-Chairman of the Corporation of Lloyd's, and the Chairman, or, in his absence, the Deputy-Chairman of the General Shipowners' Society, for the time being, to be, *ex-officio*, Members of the Committee.

Any member (except an ex-officio member) who fails to attend any meetings of the Committee for a period of six continuous months, without leave of absence, shall cease to be a member, and his place shall be filled up in the usual way.

Note.—Official intimation to be given in June of each year whether the Chairman or Deputy-Chairman of the Corporation of Lloyd's, and the Chairman or Deputy-Chairman of the General Shipowners' Society, are to be the *ex-officio* members for the ensuing twelve months.

Section 8. The General Committee reserve the right of varying or withdrawing the representation of Outports, and of Shipbuilders and Engineers; also the representation of Shipbuilders, Engineers, Steel Makers, and Forgemasters on the Technical Sub-Committee hereinafter mentioned, as well as the mode of election of members.

Section 9. Six of the Members elected in London, namely, two of each of the constituent parts of the Committee, to go out annually by rotation, but to be eligible to be re-elected. The vacancies so arising to be filled up by the election of two Underwriters and one Merchant by the Committee of Lloyd's, and two Shipowners and one Merchant by the Committee of the General Shipowners' Society.

2. Of the Members elected at the Outports twenty-two to retire at the end of *four* years, and six of the Members elected at Liverpool and the eight Members elected at Glasgow to retire annually. The retiring Members are eligible for re-election.

Section 10. The Committee to appoint Sub-Committees of Classification, to be so regulated that each Member of the General Committee may, in rotation, take his turn of duty thereon throughout the year.

Section 11. The Committee to appoint from their own body, annually, a Chairman and Deputy-Chairman; and also a Chairman or Chairmen of the Sub-Committees of Classification.

Section 12. The Secretary, Clerks, and Servants of the Society, and the Surveyors, to be appointed by and be under the direction of the General Committee.

Section 13. Special meetings to be convened by order of the Chairman, or Deputy-Chairman, or on the requisition of any three Members.

Section 14. All elections and appointments to be made by ballot, excepting when in the election of Chairman, Deputy-Chairman, or Chairman or Chairmen of the Sub-Committees of Classification, only one person is nominated for each office.

Section 15. No Member of the Committee to be permitted to be present on the decision of the classification of any ship of which he is the owner, or wherein he is directly, or indirectly interested.

Section 16. 1. The Committee to be empowered to make such Bye-laws for their own government and proceedings as they may deem requisite, not being inconsistent with the original Rules and Regulations under which the Society was established ; but no new Rule or Bye-law to be introduced, or any Rule or Bye-law altered, without special notice being given for that purpose at the Meeting of the Committee next preceding that at which such Motion is intended to be made ; such notice to be inserted in the summons convening the meeting.

2. No new Rule, or alteration in any existing Rule materially affecting the classification of Ships, to be applied compulsorily to vessels of which the plans have been submitted and approved before the expiration of six months after the date when the change has been adopted.

Section 17. 1. That fifteen representatives of Shipbuilders, Engineers, Steel Makers, and Forgemasters shall be admitted as members of the Technical Sub-Committee on all occasions when it is proposed to make alterations in the existing rules, or to frame new rules, for the construction of ships or machinery.

2. That twelve representatives of Shipbuilders and Engineers shall be elected by the following bodies, viz. :

(*a*) The Institution of Naval Architects, London ;

(*b*) The North-East Coast Institution of Engineers and Shipbuilders, Newcastle-on-Tyne ; and

(*c*) The Institution of Engineers and Shipbuilders in Scotland, Glasgow,

two shipbuilders and two engineers being elected by each body ;

That two representatives of Steel Makers be elected by the Iron and Steel Institute, of whom one is to represent England and Wales, and the other Scotland ; also

That one representative of Forgemasters be elected by the English and Scottish Forgemasters' Association.

3. That the representatives shall be elected for a term of two years, but in the event of any vacancy occurring before the expiration of this period a representative may be elected to fill the vacancy for the unexpired portion of the term.

4. That those only who are actually partners in firms, or managers of joint stock companies, engaged in Shipbuilding, Engineering, Steelmaking, or the Manufacture of Forgings, shall be eligible for election.

5. That the Chairman of the Committee of Lloyd's Register of British and Foreign Shipping, for the time being, or, in his absence, the Deputy-Chairman ; or, failing him, some other member of the General Committee shall preside at the meetings of the Sub-Committee.

6. That the representatives of Shipbuilders, Engineers, Steel Makers, and Forgemasters shall have the same rights and powers as the other members of the Sub-Committee in speaking and voting at the meetings of the Sub-Committee at which they are entitled to be present.

7. That it shall be open to representatives of Shipbuilders, Engineers, Steel Makers, and Forgemasters to propose alterations in, or additions to, the Rules for the construction of ships or machinery ; and that notice of all such proposals shall be sent in writing to the Secretary.

8. That meetings of the Sub-Committee shall be convened as often and at such times as may appear necessary to the General Committee, but there shall be at least two meetings in the year, though not necessarily one in each six months.

9. That every meeting shall be convened by notice from the Secretary at least one month before the date of meeting; that the meetings shall, whenever practicable, be arranged for Tuesday afternoons; that notice of matters proposed to be brought before the Sub-Committee by members shall be sent to the Secretary not less than fourteen days before the meeting, and the Secretary shall, as soon as possible thereafter, send to each member an agenda paper.

10. That the recommendations of the Sub-Committee shall be reported to the General Committee, who will refer them for consideration to a Special Meeting of the General Committee, as required by Section 16 of the Rules.

11. That in the event of eight representatives of Shipbuilders, Engineers, Steel Makers, and Forgemasters, actually voting together on any question, and nevertheless failing to obtain a majority of the Sub-Committee, it shall be open to them to present a minority report to the General Committee.

12. That the General Committee reserve to themselves the right of varying, adding to, or rescinding, at their discretion, any or all of the foregoing Rules.

Section 18. All Reports of survey to be made in writing by the Surveyors according to the form prescribed, and submitted for the consideration of the General Committee, or of the Sub-Committees of Classification; but the character assigned by the latter to be subject to confirmation by the General Committee.

Section 19. 1. The reports of the Surveyors, and all documents and proceedings relating to the classification of ships are to be carefully preserved and to be open to the inspection of the Owners, but no other person or persons are to have access to such documents except with the written consent of the Owners and under the direction of the Chairman, or Deputy-Chairman.

2. Copies of the original reports (if the ships be already classed, but not otherwise), so far as relates to the dimensions, scantlings, fastenings, and materials, in cases where the correctness of the reports in these particulars is certified by the builders, are granted on application.

Section 20. Foreign ships, and ships built in the British possessions abroad where there is not a Surveyor (*see also* Section 52 of the Rules for Wood Vessels), to be surveyed on their arrival at a port to which a Surveyor has been appointed; but a due regard is to be had to the circumstance of such vessels having been exempted from supervision while building, and the Character to be assigned to them is to be regulated according to their intrinsic quality and from the best information the Committee can obtain.

Section 21. In every case in which the Character assigned to a ship may be proposed, on survey, to be reduced, notice is to be given in writing to the Owner, Master, or Agent, with an intimation that if the reduction be objected to, the Committee will be ready to direct a special survey, on the Owner, Master, or Agent agreeing to pay the expenses attending the same, provided on the said survey there shall appear sufficient ground for the proposed reduction.

Section 22. 1. When the Surveyors consider repairs to be requisite, they are respectfully to communicate the same in writing to the Owner, Master, or Agent, and if such repairs be not entered upon within a reasonable time, a corresponding report is to be made, as soon as possible, to the Committee for their decision thereon.

2. All repairs of Ships or Machinery required at Ports where there is a Surveyor to this Society, in order to their obtaining a Character in the Register Book, or to their retaining the Characters assigned to them therein, must be carried out under the inspection, and to the satisfaction of the Society's Surveyors. Ships or machinery repaired at Ports where there is no Surveyor to this Society must be surveyed by one of the Society's Surveyors at the earliest opportunity.

Section 23. Parties considering the repairs suggested by the Surveyor to be unnecessary or unreasonable may appeal to the Committee, who will direct a special survey to be held ; but should the opinion of the Surveyor be confirmed by the Committee, then the expense of such special survey is to be paid by the party appealing.

Section 24. The Surveyors to the Society not to be permitted (without the especial sanction of the Committee) to receive any fee, gratuity, or reward whatsoever for their own use or benefit, for any service performed by them in their capacity of Surveyors to this Society, on pain of immediate dismissal.

Section 25. The Surveyors will be directed to attend on Special Surveys of ships or machinery while building or under damage or repair, when required by Merchants, Shipowners, or Underwriters ; the charge for which is to be regulated according to the nature and extent of the service performed. In all cases, the application for the assistance of the Surveyors must be made in writing addressed to the Secretary.

Section 26. While the Committee use their best endeavours to ensure that the functions of the Society are properly executed, it is to be understood that neither the Committee nor the Society are under any circumstances whatever to be held responsible for any inaccuracy in any report or certificate issued by the Society or its Surveyors, or in any entry in the Register Book or other publication of the Society, or for any error of judgment, default, or negligence of the Surveyors, or other Officers or Agents of the Society.

FUNDS.

Section 27. The Funds to be under the authority and control of the Committee, and a statement of the Receipts and Expenditure to be annually printed for the information of the subscribers.

Section 28. The following Fees to be charged to the Owners of ships prior to their vessels being classed and registered in the book :—

Classing Fees.

For First Entry of Class in the Register Book.

For each Ship under 200 tons	£1	0	0
Ditto of 200 and under 500 tons	2	0	0
Ditto of 500 „ 1,000 „	3	0	0
Ditto of 1,000 „ 2,000 „	4	0	0
Ditto of 2,000 and upwards	5	0	0

For First Entry of Notification "LMC" in the Register Book.

For each Ship under 100 nominal HP....	...	...	...	£1	0	0
Ditto	of	100 and under 300 HP. ...	...	2	0	0
Ditto	of	300 and above ...	...	3	0	0

SPECIAL SURVEYS.

Section 29. 1. For ships built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✠) :—1s. per ton for the first 1,000 tons ; 6d. per ton for every ton from 1,001 tons to 10,000 tons ; 4d. per ton for every ton from 10,001 tons to 20,000 tons ; and 2d. per ton for every ton beyond 20,000 tons. No fee to be less than £7 0s. 0d.

2. For engines and boilers built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✠ in red) :—three shillings per horse-power for the first 200 horse-power ; one shilling for each horse-power from 201 to 1,000 ; 6d. for each horse-power from 1,001 to 3,000 ; and 3d. for each horse-power beyond 3,000. No fee to be less than £8 0s. 0d.

The following rule is to be used for determining the Nominal Horse power of Engines in regulating the fees for their survey, viz. :—

$$\text{NHP} = \frac{\text{P} + 340}{1000}\left(\frac{\text{D}^2\sqrt{\text{S}}}{100} + \frac{\text{H}}{15}\right) \text{ where the boiler pressure is below 160 lbs.}$$

$$= \frac{\text{P} + 590}{1500}\left(\frac{\text{D}^2\sqrt{\text{S}}}{100} + \frac{\text{H}}{15}\right) \text{ where the boiler pressure is 160 lbs. or above.}$$

If the boilers are fitted with Forced Draught or Induced Draught appliances, then $\frac{\text{H}}{12}$ is to be taken instead of $\frac{\text{H}}{15}$.

where D = diameter of L.P. Cylinder in inches.

S = stroke in inches.

H = heating surface in square feet.

P = working pressure in lbs. per square inch.

The square feet of heating surface represented by H will comprise the surfaces of the tubes, of the back tube plate or plates, and of the furnace and combustion chamber plating down to the level of the fire bars.

3. For the survey and testing of each Donkey Boiler, a fee of two guineas will be charged.

4. No charge will be made for occasional or docking surveys, or for surveying repairs consequent on ordinary wear and tear, at ports in the United Kingdom.

For the survey of damage repairs essential to the continuation of class (whether a special damage report be required or not), for surveys with a view to the re-instatement of class, and for the survey of alterations in the structure of a vessel, a fee will be charged according to the nature and extent of the services performed.

For all surveys held at Foreign ports a fee will be chargeable according to the nature and extent of the services rendered.

5. **SPECIAL PERIODICAL SURVEYS, Nos. 1, 2, and 3.**

For the special periodical surveys of Iron and Steel Vessels, when such surveys are held by the Society's exclusive Surveyors in the United Kingdom.

	S.S. No. 1.	S.S. No. 2.	S.S. No. 3.
	£ s.	£ s.	£ s.
For Vessels under 150 tons gross	1 0	1 10	3 0
" " 200 "	1 10	2 0	3 10
" " 250 "	2 0	2 10	4 0
" " 300 "	2 10	3 10	4 10
" " 400 "	3 0	4 0	5 0
" " 800 "	3 10	4 10	6 0
" " 1,200 "	4 0	5 0	7 0
" " 1,800 "	4 10	5 10	8 0
" " 2,500 "	5 0	6 0	9 0
" " 3,500 "	5 10	6 10	10 0
" of 3,500 " and above ...	6 0	7 0	10 0

SPECIAL PERIODICAL SURVEYS OF MACHINERY.

Held at the Special Surveys, Nos. 1, 2, *and* 3.

For each Ship under 50 nominal HP.	£2 0 0
" " 75 "	2 10 0
" " 100 "	3 10 0
" " 150 "	4 0 0
" " 200 "	4 10 0
" " 300 "	5 0 0
" of 300 " and above	5 10 0

SPECIAL ANNUAL SURVEYS OF BOILERS.

To be held when and after the Boilers are six years old.

For each Ship having 1 boiler	£1 0 0
And for each additional boiler (including the donkey boiler)	0 10 0
But the fee in no case to be more than	3 0 0
For survey of donkey boiler of sailing vessels	1 0 0

6. For Surveys for Restoration, Continuation, or the character A in Red, and in cases where the caulking of ships is superintended and tested by the Surveyors a charge will be made according to the nature and extent of the services rendered.

7. All repairs which may be required on the Surveys above referred to, must be performed under the superintendence of the Society's Surveyors. (*See also* Section 22.)

MEM.—It is to be understood that in all cases where travelling expenses are incurred by the Surveyors in connection with the above services, they are to be defrayed by the parties interested in the same.

Section 30. The class of a vessel is liable to be withheld, or, if already granted, may be withdrawn or expunged from the Register Book in the case of non-payment of any fees or expenses chargeable on account of such vessel.

Section 31. Certificates of Classification, signed by the Chairman, Deputy-Chairman, or Chairman of the Sub-Committee of Classification, and countersigned by the Secretary, will be granted on application.

FREEBOARD.

Section 32. Fees for the Survey for, and assignment of, Freeboard.

	Classed Vessels.			Unclassed Vessels.		
For Vessels under 300 tons gross	£1	1	0	£ 2	2	0
„ „ of 300 tons and under 1,000 tons gross... ...	2	2	0	3	3	0
„ „ 1,000 „ „ 2,000 „	3	3	0	5	5	0
„ „ 2,000 „ „ 3,000 „	4	4	0	6	6	0
„ „ 3,000 „ „ 4,000 „	5	5	0	8	8	0
„ „ 4,000 „ and above	6	6	0	10	10	0

Section 33. Rules for Steel Ships, 5s.; if for Wood Ships and Composite Ships, 5s.

GENERAL REGULATIONS

RELATING TO THE

CLASSIFICATION OF STEEL VESSELS.

1. Classification. 1. *General.*—Steel vessels built in accordance with the Society's Rules and Regulations, or with alternative arrangements equivalent thereto, will be classed 100A so long as they are found, upon careful annual and periodical survey, to be in a fit and efficient condition for the safe conveyance of dry and perishable cargoes. Vessels which do not fully satisfy the requirements for the 100A class may, if the Committee approve, be classed 90A.

Deviations from the Rules will be allowed, provided they are submitted to the Committee and considered by them to be equivalent to the requirements of the Rules. The Builder is required to obtain the Owners' sanction to such deviations, when the Committee deem it to be necessary.

2. *Classes for Special Trades.*—Vessels which are intended for special trades or purposes, and which are considered by the Committee to be fit for the contemplated employment, will be classed A without a numeral prefixed, provided all the details of the proposed scantlings and arrangements are submitted to the Committee and approved by them, and provided the Rules are otherwise complied with. To the class A, in such cases, will be affixed notations showing the particular trades or purposes for which the vessels are intended, thus :- A "For river purposes only" ; A "For tug purposes" ; A "Fishing Smack" ; A "For channel purposes" ; &c. In the cases of vessels intended for channel purposes, the particular channel will be defined thus : "Bristol Channel," "Irish Channel," "English Channel," "Newhaven—Dieppe," &c.

Vessels built in accordance with the "Rules for the construction of vessels intended to carry oil in bulk," or that may be classed by the Committee for that purpose, will have the following notation inserted under their class in the Register Book—"Carrying petroleum in bulk."

3. *Vessels classed "with freeboard."*—In the cases of awning or shelter deck steamers and channel steamers, and, in such other cases as the Committee may consider necessary, it is a condition of classification that a minimum freeboard shall be submitted to and approved by the Committee. In such cases the words "with freeboard" will be inserted under the character in the certificates of class and in the Register Book, and the freeboard must be marked on the vessel's sides in the manner shown by the diagrams printed at the end of the Rules.

Whenever the character of a vessel to which a minimum freeboard has been assigned as a condition of classification is for any reason withdrawn or expunged from the Register Book, the record of freeboard will be omitted on the next reprint of the Register Book, unless the character has been previously reinstated.

2. Submission of Plans.—In all cases in which it is intended to build vessels for classification in the Register Book, sketches of midship section and profile, with deck and other plans, showing the proposed dimensions, scantlings and arrangements, must in the first place be submitted by the builders through the local Surveyors, for the approval of the Committee.

3. Special Survey during Construction.—Vessels intended for classification in the Register Book are to be built under the Society's Special Survey, and vessels so built will be entitled to the distinctive mark ✠ in the Register Book.

During the progress of construction, from the laying of the keel to the completion of a vessel, it is the duty of the Surveyors to examine the material and workmanship in order to ensure that the requirements of the Rules and the approved plans are satisfactorily carried out. The Surveyors are required to point out as early as possible anything that is objectionable, or that is not in accordance with the Rules or with the plans approved by the Committee for the particular vessel.

4. Vessels not built under Survey.—The requirements of the Committee in cases in which it may afterwards be desired that vessels which have not been built under the Society's survey should be assigned classes in the Register Book are set forth on page 58.

5. Engines and Boilers. 1. *General.*—The engines and boilers of steam vessels intended for classification, or already classed, in the Register Book, must be constructed under the Society's Special Survey. Appropriate records will be made in the Register Book in red ink, as follows, viz.:—✠LMC. 6,11 (Lloyd's Machinery Certificate, June, 1911); ✠N.E.&B. 6,11 (New Engines and Boilers, June, 1911); ✠N.E. 6,11; or ✠N.B. 6,11. The requirements relating to the construction and survey of engines and boilers, are set forth on pages 71 to 84.

2. *Novel Types, &c.*—In cases in which the engines or boilers are of novel description, or in which experience has not sufficiently shown the safety of the principle or mode of application involved, the words "Machinery Experimental," or "Boiler Experimental," will be inserted under the class of the vessel in the Register Book; but if, in the opinion of the Committee, the engines or boilers are so far inefficient as to imperil the vessel's safety, no class will be assigned.

6. Equipment.—The figure 1 placed after the character assigned to a vessel, thus :- 100A1 will denote that the vessel's equipment is in good and efficient condition and otherwise in accordance with the requirements of the Rules. In cases in which the requirements of the Rules as to equipment have not been complied with, or in which the equipment is found to be insufficient in quantity or defective in quality, a line will be inserted in place of the figure 1, thus :- 100A—.

7. Date of Build.—In all cases of vessels built under special survey, the date of the completion of such survey will be taken as the date of build of the vessel, provided the survey be completed within six months of the date of launching for vessels under 10,000 tons gross, nine months for vessels of 10,000 tons and under 20,000 tons gross, and twelve months for vessels of 20,000 tons gross and upwards. When, however, the special survey is not completed within the period allowed, the date of build will be taken as six, nine, or twelve months after the date of launching, as the case may be.

8. Periodical Special Surveys. 1. *General.*—To entitle steel vessels to retain the characters assigned to them in the Register Book, they are required to be subjected to the Periodical Special Surveys, designated No. 1, No. 2, and No. 3 (the requirements for which are set forth at pages 13 to 18). These surveys severally become due, in the cases of vessels classed 100A or 90A at 4 years, 8 years, and 12 years respectively from the date of build, and subsequently at the expiration of like periods from the date recorded in the Register Book of the previous Special Survey No. 3. Should a vessel at any time be submitted to Special Survey No. 3 before being 12 years old, the Special Surveys

subsequently required will be Nos. 1, 2 and 3, at 4 years, 8 years, and 12 years, respectively from the date recorded in the Register Book of such Special Survey No. 3.

2. *Vessels classed for special trades.*—Vessels classed A for special purposes are required to be subjected to Special Surveys Nos. 1, 2, and 3 (the requirements for which are set forth at pages 13 to 18), at 3 years, 6 years, and 9 years, respectively, from the date of build, and at the expiration of like periods from the date recorded in the Register Book of the previous Special Survey No. 3.

3. *Surveys held in anticipation.*—In cases in which it may suit the convenience of the owners, the Special Surveys No. 1 and 2 may be held at any time within twelve months previous to the dates at which they severally become due, and the Special Survey No. 3 may be held at any time before the date at which it becomes due.

4. *Period allowed for completion of surveys.*—In cases in which it is inconvenient to owners to fulfil all the requirements of either of the Periodical Special Surveys at the prescribed time, part only of the survey need be then carried out, provided the remainder of the survey be completed within twelve months from the date at which it became due. When a special survey is only partly held, the Surveyors must give the owners or their agents written notice of the parts not surveyed, and report the facts to the Committee.

5. *Record of Periodical Special Surveys in Register Book.*—Vessels which have satisfactorily passed any of the Periodical Special Surveys will have notations made against their names in the Register Book indicating the survey and the date at which it was held thus :—*ss*No.1-11, *ss*No.2-11, *ss*No.3-6,11, 2nd*ss*No.3-6,11. In cases in which Special Surveys are not completely carried out at one time, the date of Special Survey recorded in the Register Book will be the date of the survey at which the principal part of the requirements are complied with.

6. *Engines and Boilers.*—Particulars of the requirements for, and of the records made in the Register Book concerning the periodical survey of the engines and boilers of steam vessels, and of the donkey boilers of sailing vessels, are set forth at pages 83 and 84.

9. **Occasional Surveys.**—All vessels are subject to Annual, or Occasional, Surveys when practicable. The requirements in respect of such surveys are set forth at page 18.

10. **Survey of Repairs.**—All repairs of vessels, engines and boilers that may be required at ports where there is a Surveyor to the Society, in order that the vessels may retain their characters in the Register Book, must be carried out under the inspection and to the satisfaction of the Society's Surveyor. When such repairs are effected at a port where there is no Surveyor to this Society, the vessel must be surveyed by one of the Society's Surveyors at the earliest opportunity.

When the Surveyors consider repairs to be requisite, they are respectfully to communicate the same in writing to the owner, master, or agent; and, if such repairs be not entered upon within a reasonable time, a corresponding report is to be made, as soon as possible, to the Committee for their decision thereon.

11. **Notice of Surveys.**—Whilst the Society's Surveyors are required to attend for the purpose of holding surveys in their district, the duty of giving notice when the attendance of the Surveyors is required to carry out Periodical Special Surveys or to supervise repairs rests with the owners, master, or agents. If such notice is not given, and the requisite surveys are not carried out, the characters of vessels are liable to be expunged from the Register Book.

12. Appeal from Surveyor's recommendations. — Interested parties considering the recommendations of the Society's Surveyors, as to the construction or repair of a vessel, to be in any case unnecessary or unreasonable, are entitled to appeal to the Committee, who will direct a special survey to be held ; but should the opinion of the Surveyor be confirmed by the Committee, the expense of such special survey is to be paid by the party appealing.

13. Certificates of Class. 1. *General.* — Certificates of first entry of classification, and certificates of character upon subsequent completed surveys on vessels, engines, and boilers, signed by the Chairman, the Deputy-Chairman, or the Chairman of the Sub-Committees of Classification, and countersigned by the Secretary, will be granted on application.

2. *Provisional Certificates.*—If the hull of a steamer has been built in accordance with the Rules, and a satisfactory report has been received from the Society's Surveyors, a provisional certificate will be issued, if desired, stating the class to which the vessel will be entitled when the engines and boilers have been fitted on board in accordance with the Rules, and the Committee's requirements otherwise complied with.

14. Reconsideration of Class.—If, upon survey of any vessel, material reduction is found to have taken place in the thickness of the plating and angles, the classification of the vessel will be reconsidered by the Committee. In every case in which the class assigned to a vessel is proposed to be reduced, notice is to be given in writing to the owner, master, or agent, with an intimation that if the reduction be objected to, the Committee will be ready to direct a special survey, if the owner, master, or agent agrees to pay the expenses attending the same, provided on the said special survey there shall appear sufficient ground for the proposed reduction.

15. Withdrawal of Class. 1. *Non-compliance with Rules.* — When the Rules as regards surveys on the hull, engines or boilers of a steam vessel, or on the hull, masts, spars, or rigging of a sailing vessel have not been complied with, so that the vessel is not entitled to retain her class in the Register Book, the character will be expunged with a red line, under which the date of such withdrawal of class will be recorded.

2. *Reported defects.*—When it is found from reported defects in the hull, engines or boilers of a steam vessel, or in the hull, masts, spars, or rigging of a sailing vessel, that the vessel is not entitled to retain her class in the Register Book, the character will be expunged with a black line, under which the date of such withdrawal of class will be recorded.

3. *Owner's request.*—When the class of a vessel is withdrawn from the Register Book by the Committee in consequence of a request from the owner, the fact will be indicated by the insertion of three dots (...) in column 7 of the Register of steam vessels and column 8 of the Register of sailing vessels.

4. *Infringement of conditions as to minimum freeboard.*—If any vessel, to which a minimum freeboard has been assigned as a condition of classification, proceeds to sea with a less freeboard than that approved by the Committee, or if the freeboard mark is placed higher on the vessel's sides than the position assigned by the Committee, the vessel's class will be liable to be expunged from the Register Book.

PERIODICAL SPECIAL SURVEYS

OF

STEEL VESSELS.

SPECIAL SURVEY No. 1.

1. The vessel is to be placed on blocks of sufficient height in a dry dock or on a slipway ; proper stages are to be made ; and the holds and peaks are to be cleared for examination.

2. The limber boards and ceiling equal to not less than two strakes fore and aft on each side are to be removed, one such strake being taken from the bilges. Where the ceiling in the flat of bottom is fitted in hatches, the whole of the hatches and one strake of ceiling at the bilges are to be removed. At second and subsequent Special Surveys No. 1, additional ceiling is to be lifted at other parts of the vessel where deemed necessary by the Surveyor to enable him to satisfy himself as to the condition of the vessel.

3. The coal bunkers of steam vessels are to be cleared for examination, and ceiling is to be removed as in the holds. The bilges and limbers in the engine and boiler spaces are to be cleaned out, so as to allow of these parts being properly examined.

4. The framing and both surfaces of outside plating are to be exposed, and cleaned and coated where necessary.

5. In cases in which the inner surface of the bottom plating is coated with cement or asphalt, the removal of this coating may be dispensed with provided it be carefully inspected, tested by beating or chipping, and found sound and adhering satisfactorily to the steel.

6. If the vessel has a double bottom, the ceiling is to be removed therefrom and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where peak tanks or other deep water ballast tanks are fitted, their watertightness is to be tested by a head of water not less than 8 feet above the crown of the tank. All water ballast tanks are to be cleaned out, to admit of their being properly examined inside.

7. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it is to be renewed. If, however, such deck is found on survey to be in good condition, the case will, upon application, receive the consideration of the Committee.

8. The anchors are to be examined and placed in good condition, and when a vessel is undergoing Special Survey No. 1, after having passed Special Survey No. 3, the chain cables are also to be ranged for inspection ; any length of chain cable which is found to be reduced in mean diameter at its most worn part to the extent indicated on the backs of Tables 30 and 31, is to be renewed; the windlass, if of wood, is to be unhung, where necessary, and its wood linings are to be sufficiently stripped for examination, unless this requirement was carried out at the previous Periodical Special Survey.

9. The masts, spars, and general equipment of steam and sailing vessels must be examined and found, or placed, in good and efficient condition. At second and subsequent Special Surveys No. 1, the mast and bowsprit wedging is to be removed, unless the plating of iron or steel masts and bowsprits is doubled in way of the same.

10. The hatches are to be examined in position at the hatchways, and, if defective, are to be renewed or made good.

11. The steam steering engine and its connections, the steering rods, chains, blocks, rudder quadrant, tillers, steering gear, windlass, pumps, sluice valves, watertight doors, and air and sounding pipes are to be carefully examined, and the condition of the same is to be stated on the Surveyor's report. The Surveyor must see that doubling plates are fitted under all sounding pipes.

12. Where holds are insulated for the purpose of carrying frozen or chilled meat, and the vessel in way of the insulation was examined by the Society's Surveyors at the time such insulation was fitted, it will be sufficient at the first Special Survey No. 1 if the limbers and hatches are removed and the vessel is examined in way of the same. At all subsequent Special Surveys No. 1, in addition to the above, sufficient lining is to be removed in each of the chambers to admit of the framing and plating being exposed to satisfy the Surveyor of their general condition, subject to such modifications as may be accepted by the Committee, upon application in each particular instance.

13. The engines and boilers of steam vessels and the donkey boilers of sailing vessels must be examined and favourably reported on by the Society's Engineer Surveyors. For Periodical Surveys of engines and boilers, see pages 83 and 84.

SPECIAL SURVEY No. 2.

1. The vessel is to be placed on blocks of sufficient height in a dry dock or on a slipway, proper stages are to be made ; and the holds and peaks are to be cleared for examination.

2. The limber boards and ceiling equal to not less than three strakes fore and aft on each side are to be removed, one such strake being taken from the bilges. Where the ceiling in the flat of bottom is fitted in hatches, the whole of the hatches and one strake of ceiling at the bilges are to be removed. At second and subsequent Special Surveys No. 2, additional ceiling is to be lifted at other parts of the vessel where deemed necessary by the Surveyor to enable him to satisfy himself as to the condition of the vessel.

3. The coal bunkers of steam vessels are to be cleared for examination, and ceiling is to be removed as in the holds. The bilges and limbers in the engine and boiler spaces are to be cleaned out, so as to allow of these parts being properly examined.

4. The framing and both surfaces of outside plating are to be exposed, and cleaned and coated where necessary.

5. In cases in which the inner surface of the bottom plating is coated with cement or asphalt, the removal of this coating may be dispensed with provided it be carefully inspected, tested by beating or chipping, and found sound and adhering satisfactorily to the steel.

6. If the vessel has a double bottom, the ceiling is to be removed therefrom, and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where peak tanks or other deep water ballast tanks are fitted, their watertightness is to be tested by a head of water not less than 8 feet above the crown of the tank. All water ballast tanks are to be cleaned out, to admit of their being properly examined inside.

7. When a deck originally required to be 4 inches thick is worn to 3 inches, 3½ inches to 2¾ inches, 3 inches to 2½ inches, it is to be renewed. If, however, such deck is found on survey to be in good condition, the case will, upon application, receive the consideration of the Committee.

8. The chain cables are to be ranged for inspection, and the anchors examined and put in good working condition ; any length of chain cable which is found to be reduced in mean diameter at its most worn part to the extent indicated on the backs of Tables 30 and 31, is to be renewed. The windlass, if of wood, is to be unhung, where necessary, and its wood linings are to be sufficiently stripped for examination, unless this requirement was carried out at the previous Periodical Special Survey.

9. The masts, spars, and general equipment of steam and sailing vessels must be examined and found, or placed, in good and efficient condition. At second and subsequent Special Surveys No. 2, the mast and bowsprit wedging is to be removed, unless the plating of iron or steel masts and bowsprits is doubled in way of the same.

10. The hatches are to be examined in position at the hatchways, and, if defective, are to be renewed or made good.

11. The steam steering engine and its connections, the steering rods, chains, blocks, rudder quadrant, tillers, steering gear, windlass, pumps, sluice valves, water-tight doors, and air and sounding pipes are to be carefully examined, and the condition of the same is to be stated on the Surveyor's report. The Surveyor must see that doubling plates are fitted under all sounding pipes.

12. Where holds are insulated for the purpose of carrying frozen or chilled meat, and the vessel in way of the insulation was examined by the Society's Surveyors at the time such insulation was fitted, it will be sufficient at the first Special Survey No. 2 if the limbers and hatches are removed and the vessel is examined in way of the same. At all subsequent Special Surveys No. 2, in addition to the above, sufficient lining is to be removed in each of the chambers to admit of the framing and plating being exposed to satisfy the Surveyor of their general condition, subject to such modifications as may be accepted by the Committee upon application in each particular instance.

13. The engines and boilers of steam vessels and the donkey boilers of sailing vessels must be examined and favourably reported on by the Society's Engineer Surveyors. For periodical Surveys of engines and boilers, see pages 83 and 84.

SPECIAL SURVEY No. 3.

To be held by two Surveyors, one at least to be an officer of the Society.

1. The vessel is to be placed on blocks of sufficient height in a dry dock or on a slipway ; proper stages are to be made ; and the holds and peaks are to be cleared for examination.

2. All close ceiling is to be removed, so that the flat of bottom may be thoroughly examined. The whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets and inner surfaces of the outside plating are to be exposed. Where side lights are fitted, the condition of the plating in way of the same is to be ascertained. In iron and steel steam trawlers and other fishing vessels in which close ceiling is fitted at the sides of the holds above the bilges, provided a strake of this close ceiling be removed at the upper turn of bilge and another at the upper part of the side of the vessel, right fore and aft of the holds on both sides, and the condition of the iron or steel work of the shell plating, frames, reverse frames, &c., is found to be satisfactory, the removal of the remainder of the close ceiling above the bilges may be dispensed with. Whenever the close ceiling of these vessels is renewed, the Surveyor should report upon the condition of the iron or steel work in way of same.

3. The coal bunkers of steam vessels are to be cleared for examination and all ceiling is to be removed as in the holds. The bilges and limbers in the engine and boiler spaces are to be cleaned out, so as to allow of these parts being properly examined.

4. All rust is to be cut or beaten off the steel and iron throughout the vessel. The planksheers and waterways, if of wood, are to be scraped bright. When the vessel is thus prepared, the Surveyors are to satisfy themselves thoroughly as to the condition of the plating. If the Surveyors deem it necessary, the thickness of the plating is to be ascertained by drilling holes in parts to be indicated by them, and in such cases a detailed statement of the thicknesses is to be included in the Surveyors' report. Any parts that are found defective, or materially less in substance than is required by the Rules, are to be removed and replaced with proper materials, equal in substance and quality to that used in the original construction of the vessel. All the scaled or chipped surfaces of the iron and steel are to be recoated. The planksheers, waterways, flat of decks and their fastenings, are also to be examined and made good where necessary. Where the deterioration in thickness is widespread, and it is not deemed advisable by the owner to renew the material, a detailed report is to be made by the Surveyors, and the class of the vessel will be reconsidered by the Committee.

5. In cases in which the inner surface of the bottom plating is coated with cement or asphalt, the removal of this coating may be dispensed with provided it be carefully inspected, tested by beating or chipping, and found sound, and adhering satisfactorily to the steel.

6. If the vessel has a double bottom, the ceiling is to be removed therefrom and the efficiency of the tanks tested by a head of water to the height of the light water-line. Where peak tanks or other deep water ballast tanks are fitted, their watertightness is to be tested by a head of water not less than 8 feet above the crown of the tank. All water ballast tanks are to be cleaned out, to admit of their being properly examined inside.

7. When a deck originally required to be 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches, it is to be renewed. If, however, such deck is found on survey to be in good condition, the case will, upon application, receive the consideration of the Committee.

8. The chain cables are to be ranged for inspection, and the anchors examined and put in good working condition ; any length of chain cable which is found to be reduced in mean diameter at its most worn part to the extent indicated on the backs of Tables 30 and 31, is to be renewed. The windlass, if of wood, is to be unhung, where necessary, and its wood linings are to be sufficiently stripped for examination, unless this requirement was carried out at the previous Periodical Special Survey.

9. The masts, spars, and general equipment of steam and sailing vessels must be examined and found, or placed, in good and efficient condition. All mast and bowsprit wedging is to be removed, whether the plating of iron or steel masts and bowsprits is doubled in way of the same or not. Iron or steel masts, bowsprits, and yards are to be carefully tested by hammering ; and if the plates are considered by the Surveyors to be materially wasted at any part, the thickness is to be ascertained by drilling. In sailing vessels, the standing rigging is to be lifted and the service and parcelling stripped off the nips, bends, and splices for examination ; if, however, the rigging has been recently lifted, particulars of the case are to be submitted for the consideration of the Committee. The bobstay pins, the deadeyes, and rigging screws to the whole of the standing rigging, also all bolts or pins and fittings, are to be carefully examined.

10. The hatches are to be examined in position at the hatchways, and, if defective, are to be renewed or made good.

11. The steam steering engine and its connections, the steering rods, chains, blocks, rudder quadrant, tillers, steering gear, windlass, pumps, sluice valves, watertight doors, and air and sounding pipes are to be carefully examined, and the condition of the same is to be stated on the Surveyors' report. The Surveyors must see that doubling plates are fitted under all sounding pipes.

12. Where holds are insulated for the purpose of carrying frozen or chilled meat, and the vessel in way of the insulation was examined by the Society's Surveyors at the time such insulation was fitted, the limbers and hatches are to be lifted, and enough lining is to be removed in each of the chambers to admit of the framing and plating being exposed to satisfy the Surveyors of the general condition of the same.

13. The engines and boilers of steam vessels and the donkey boilers of sailing vessels must be examined and favourably reported on by the Society's Engineer Surveyors. For Periodical Surveys of engines and boilers, see pages 83 and 84.

Second and subsequent Special Surveys No 3.—Additional Requirements.

1. The Surveyors are to ascertain whether the scantlings of the vessel are satisfactorily maintained in all parts.

2. In steamers, the inside of the bunkers and the parts in way of the boilers are to receive the Surveyors' particular attention, in view of the special liability of these parts to deterioration.

3. The outside plating is to be drilled at such parts as the Surveyors may consider necessary to satisfy themselves as to its thickness, the number of holes drilled on each side of the vessel being in no case less than *three in each strake* of plating not covered with cement. All paint as well as rust is to be entirely removed before the plates are gauged, and the actual thicknesses at all parts drilled are to be correctly ascertained and stated on a sketch which is to accompany the Surveyors' report.

4. The plating in way of cement in the bottom need not be drilled, provided the cement be found to be adhering satisfactorily to the plating, and the Surveyors consider drilling at this part unnecessary.

5. In cases in which a Second Special Survey No. 3 is held on a vessel before she is 24 years old, the drilling of outside plating referred to in paragraph 3 may be postponed until she reaches that age ; but, until the requirements as to drilling have been fully complied with, the survey, in such cases, will be described in the Register Book as Special Survey No. 3.

6. In cases in which the requirements of the Second Special Survey No. 3 are fully complied with before a vessel is 24 years old, the fact will be noted in the Register Book. Such notation, however, will not exempt a vessel from compliance with the requirements of the survey as regards drilling when she is 24 years old, or at the first Special Survey held after that time, unless the drilling has been done at the previous Special Survey.

7. Where holds are insulated for the purpose of carrying frozen or chilled meat, the whole of the insulating lining is to be removed.

ANNUAL OR OCCASIONAL SURVEYS OF STEEL VESSELS.

At annual, or occasional, surveys vessels should be examined generally, as far as possible.

When a vessel is placed in dry dock or on a slipway the Society's Surveyors at the port are to avail themselves of the opportunity to examine the bottom of the vessel, and to examine the vessel throughout as far as practicable in order to satisfy themselves generally as to her condition.

Whenever the engines or boilers are taken out, the bearers, with the floor plates, keelsons, rivets, etc., under them, are to be surveyed ; and whenever the bottom plating is to be cemented, a survey is to be held prior to the cement being laid. The masts and spars are to be subject to examination by the Surveyors when deemed necessary by them on other occasions besides Special Surveys.

The requirements for the survey of engines and boilers are set forth at pages 83 and 84.

RULES FOR THE BUILDING OF STEEL VESSELS.

Section 1. 1. When it is proposed to build ships of steel for classification in the Register Book, a sketch of midship section with longitudinal, deck, and other plans showing the details of the scantlings and arrangements, must in the first place be submitted through the local Surveyors for the approval of the Committee. Such vessels must be built under special survey to the plans approved and otherwise in accordance with the following Rules, subject to such modifications as may be deemed necessary by the Committee. All important plans should be submitted on tracing cloth.

Section 2. **The measurements for regulating the Scantling Numbers are to be taken as follows** (*See* **Sketch** on page 21) : —

LENGTH.

1. The **Length** (**L**) to be measured from the fore part of the stem to the after part of the stern-post on the range of the upper deck beams, except in awning or shelter deck vessels, in which cases the length is to be measured on the range of the deck beams next below the awning or shelter deck.

In vessels where the stem forms a cutwater the length (**L**) is to be measured from the place where the upper deck beam line would intersect the fore edge of stem if it were produced in the same direction as the part below the cutwater.

BREADTH.

2. The **Breadth** (**B**) is in all cases to be the greatest moulded breadth of the vessel.

DEPTH.

3. The **Depth** (**D**) is to be measured at the middle of length, from the top of keel to the top of beam at side of uppermost continuous deck, except in awning or shelter deck vessels, where it may be taken to the deck next below the awning or shelter deck, provided the height of 'tween decks does not exceed 8 feet. Where the height of 'tween decks exceeds 8 feet the (**D**) is to be measured from the top of keel to a point 8 feet below the awning or shelter deck.

In addition, a depth (**d**) is to be measured vertically at the middle of length, from top of ordinary floor at centre, or double bottom at side, to top of the beams of the lowest deck or tier of beams at side. By a "tier of beams" is meant a range of beams fitted either at every frame or at alternate frames ; or widely spaced beams not more than 24 feet apart in conjunction with a broad hold stringer. (*See* **Section 21** for size of hold stringer.)

SCANTLING NUMBERS.

4. The scantlings of the various parts of the vessel are to be determined by numbers obtained as follows :—

B + D is to be termed the **Transverse Number.**

L × (B + D) is to be termed the **Longitudinal Number.**

(**B** + **D**) regulates the frame spacing and scantlings of floors. (*See* **Tables 2, 3, 4, and 5.**)

and

considered in association with (**d**) regulates the scantlings of frames, reversed frames and web frames. (*See* **Tables 2, 3, and 5.**) For the framing and number of side stringers in way of a raised quarter deck the depth (**d**) is to be measured amidships and increased by the height of the raised quarter deck.

L × (**B** + **D**) regulates the scantlings of keel, stem, stern-post, side and bottom plating, double bottom, side stringers, keelsons, lower deck stringer plates, and lower deck plating. (*See* **Tables 1, 6, 7, 8, and 17.**)

and

considered in association with the proportions of the vessel, regulates the thicknesses of side plating and deck plating, of upper, awning or shelter decks and of long erections. (*See* **Table 18.**)

(**B**) regulates the number of keelsons. (*See* **Section 14.**)

(**d**) regulates the number of side stringers. (*See* **Tables 2, 3, and 5.**)

The length of amidship beams considered in association with the number of rows of pillars regulates the scantlings of beams. (*See* **Tables 11, 12, and 13.**)

5. In vessels of exceptional fineness of form, intended for passenger traffic, or to carry a limited amount of cargo with a fixed freeboard, a modification in the scantlings may be admitted, subject to all particulars being submitted by the Builders, and approved by the Committee, and to the deviations from the Rules being sanctioned by the Owner.

PROPORTIONS.

6. The depth used in obtaining the proportions of length to depth is to be measured, at the middle of the length, from top of keel to top of beam at side of upper deck, or awning or shelter deck, except in way of a "Long" bridge where the depth is to be taken to the bridge deck. Beyond the ends of a "Long" bridge, and throughout when there is a "Short" bridge, the depth for proportions is to be taken to the upper deck.

7. The longitudinal strengthenings in relation to the proportions of vessels are to be as shown in **Table 18.**

8. For all vessels exceeding 14 depths in length, plans showing the proposals for affording the vessels sufficient strength longitudinally must be submitted for the approval of the Committee, and all vessels having a length of 13½ depths and above are to have a bridge extending over the midship half length of the vessel, or such special compensation for extreme proportions as may be required by the Committee.

9. In all cases where structural additions may be required for a certain portion of the length of a vessel, care should be taken to avoid any abrupt termination of the additional strength so obtained, by tapering the structural additions beyond these limits, and properly shifting their terminations.

Sketch Illustrating the Method of obtaining Scantling Numbers

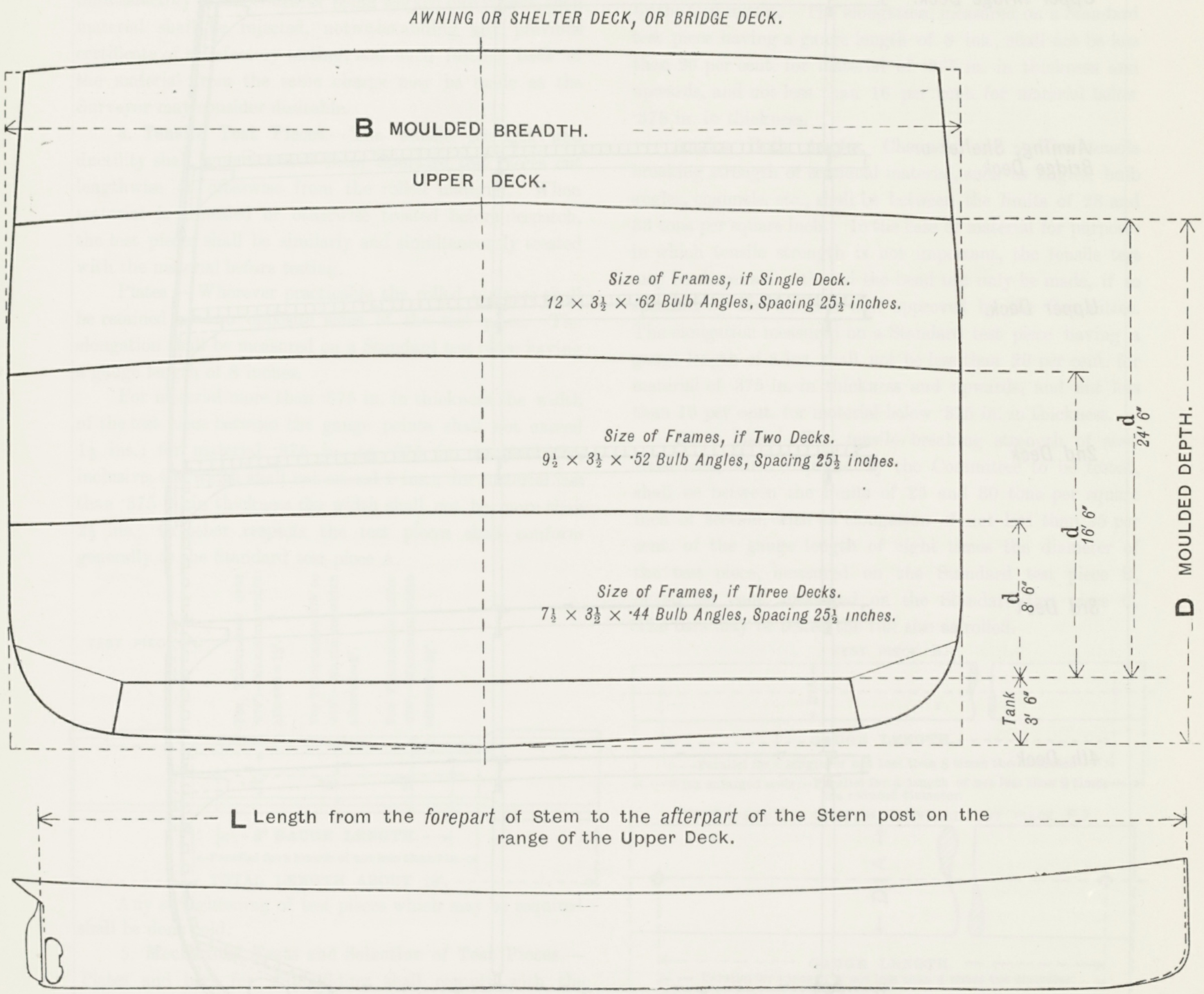
(as per Section 2).

Dimensions 380′ 0″ × 51′ 0″ × 28′ 0″ Moulded Depth to Upper Deck.

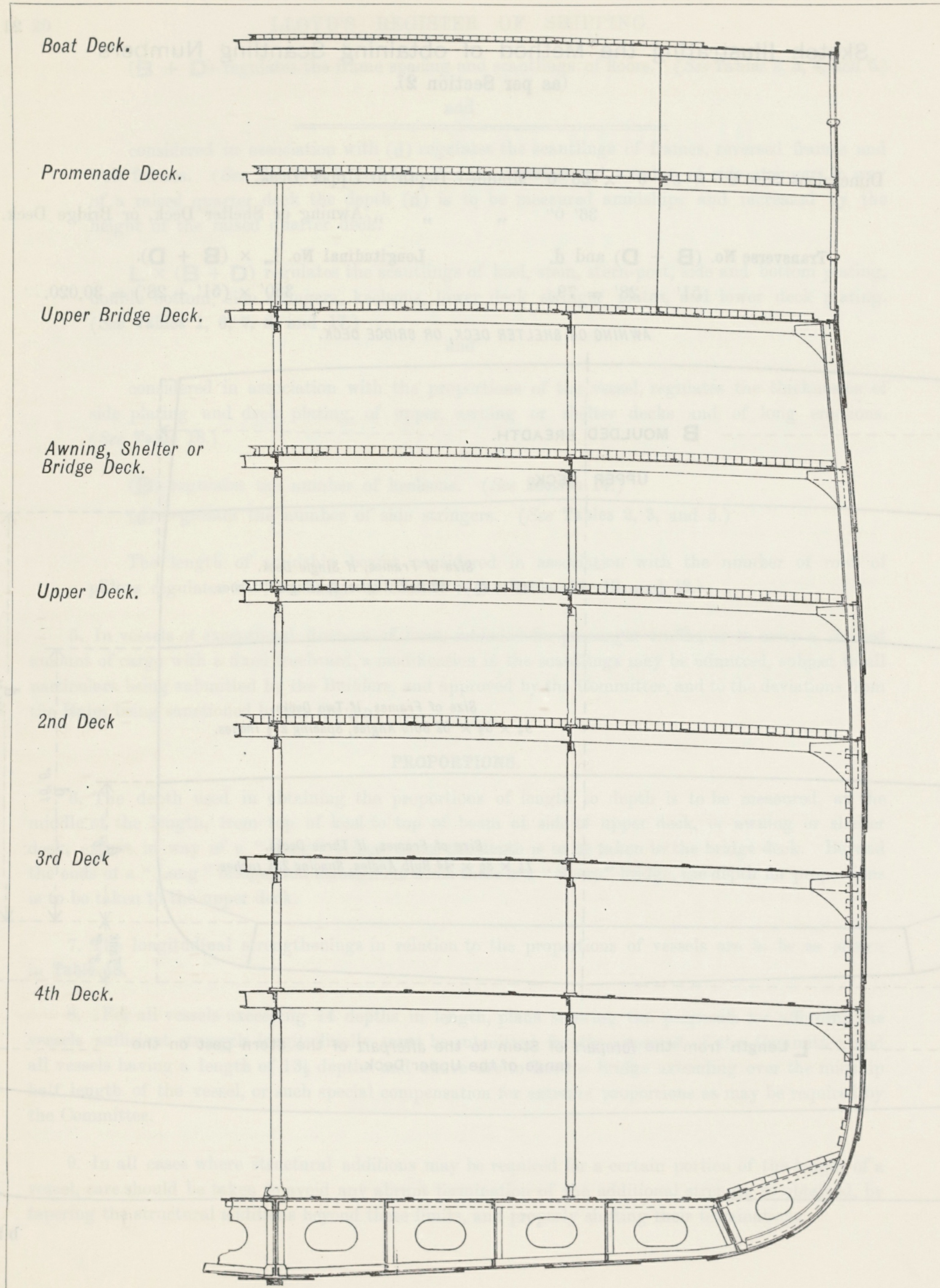
36′ 0″ „ „ „ Awning or Shelter Deck, or Bridge Deck.

Transverse No. (B + D) and d. $51' + 28' = 79$.

Longitudinal No. L × (B + D). $380' \times (51' + 28') = 30{,}020$.



Sketch of Midship Section giving designation of the various Decks.



QUALITY AND TESTING OF SHIP STEEL.

Section 3. 1. **Process of Manufacture.**—Steel for Shipbuilding shall be made by the Open Hearth process, acid or basic.

2. **Freedom from Defects.**—The finished material shall be free from cracks, surface flaws, and lamination. It shall also have a workmanlike finish, and must not have been hammer-dressed.

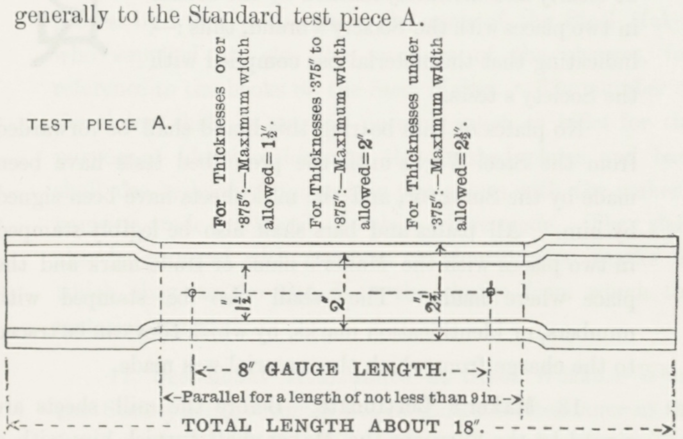
3. **Testing and Inspection.**—The following tests and inspections shall be made at the place of manufacture prior to despatch; but, in the event of any of the material proving unsatisfactory in the course of being worked into vessels, such material shall be rejected, notwithstanding any previous certificate of satisfactory testing, and such further tests of the material from the same charge may be made as the Surveyor may consider desirable.

4. **Tensile Test Pieces.**—The tensile strength and ductility shall be determined from Standard test pieces cut lengthwise or crosswise from the rolled material. When material is annealed or otherwise treated before despatch, the test pieces shall be similarly and simultaneously treated with the material before testing.

Plates:—Wherever practicable the rolled surfaces shall be retained on two opposite sides of the test piece. The elongation shall be measured on a Standard test piece having a gauge length of 8 inches.

For material more than ·875 in. in thickness the width of the test piece between the gauge points shall not exceed 1½ ins.; for material ·875 in. to ·375 in. in thickness, inclusive, the width shall not exceed 2 ins.; for material less than ·375 in. in thickness the width shall not be more than 2½ ins. In other respects the test pieces shall conform generally to the Standard test piece A.

TEST PIECE A.



Any straightening of test pieces which may be required shall be done cold.

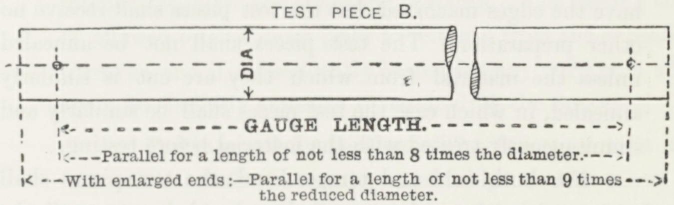
5. **Mechanical Tests and Selection of Test Pieces.**—Plates and bars for shipbuilding shall comply with the following mechanical tests. All test pieces shall be selected by the Surveyor and tested in his presence, and he shall satisfy himself that the conditions herein described are fulfilled.

6. **Tensile Tests.** Plates:—The tensile breaking strength of steel plates, determined from Standard test pieces, shall be between the limits of 28 and 32 tons per square inch. For plates specially intended for cold flanging and marked for identification, the tensile strength shall be between the limits of 26 and 30 tons per square inch. In the case of material for purposes in which tensile strength is not important, the tensile test may be dispensed with and the bend test only be made, if so specified by the builders and approved by the Committee. The elongation, measured on a Standard test piece having a gauge length of 8 ins., shall not be less than 20 per cent. for material of ·375 in. in thickness and upwards, and not less than 16 per cent. for material below ·375 in. in thickness.

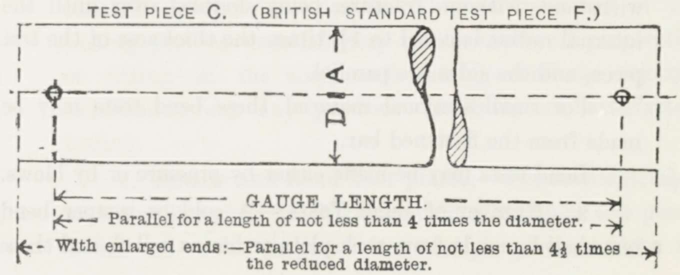
Angles, Bulb Angles, Channels, etc.:—The tensile breaking strength of sectional material, such as angles, bulb angles, channels, etc., shall be between the limits of 28 and 33 tons per square inch. In the case of material for purposes in which tensile strength is not important, the tensile test may be dispensed with and the bend test only be made, if so specified by the builders and approved by the Committee. The elongation measured on a Standard test piece having a gauge length of 8 ins. shall not be less than 20 per cent. for material of ·375 in. in thickness and upwards, and not less than 16 per cent. for material below ·375 in. in thickness.

Rivet Bars:—The tensile breaking strength of steel rivet bars, when required by the Committee to be tested, shall be between the limits of 25 and 30 tons per square inch of section, with an elongation of not less than 25 per cent. of the gauge length of eight times the diameter of the test piece, measured on the Standard test piece B, or 30 per cent. measured on the Standard test piece C. The bars may be tested the full size as rolled.

TEST PIECE B.



TEST PIECE C. (BRITISH STANDARD TEST PIECE F.)



When the Surveyor is in constant attendance at the Steel Works the following requirements are to be complied with :—

7. **Number of Tensile Tests.** Plates and Sectional Material :—One tensile test for plates or sectional material shall be taken from the finished material of each charge.

When the quantity of the material from one charge exceeds 25 tons, a second tensile test will be required; also additional tests shall be made for every variation in thickness of ·15 of an inch in the plates or sectional bars from each charge.

Rivet Bars :—When required by the Committee to be tested, one tensile test shall be taken from each charge used for rivet bars; but when the weight of the bars, as rolled, from one charge exceeds 10 tons, an additional tensile test shall be made for each further 10 tons or portion thereof.

Should a tensile test piece break outside the middle half of its gauge length, and the elongation be less than that required by the Rules, the test may, at the Maker's option, be discarded and another test be made of the same plate or bar.

8. **Bend Tests.**—Cold Bends :—Test pieces shall be sheared lengthwise or crosswise from plates or bars, and shall not be less than $1\frac{1}{2}$ ins. wide, but for small bars the whole section may be used. For rivet bars bend tests are not required.

Temper Bends :—The test pieces shall be similar to those used for cold bend tests. For temper bend tests the samples shall be heated to a blood red and quenched in water at a temperature not exceeding 80 degrees Fahr. The colour shall be judged indoors in the shade.

In all cold bend tests, and in temper bend tests on samples ·5 in. in thickness and above, the rough edge or arris caused by shearing may be removed by filing or grinding, and samples 1 in. in thickness and above may have the edges machined, but the test pieces shall receive no other preparation. The test pieces shall not be annealed unless the material from which they are cut is similarly annealed, in which case the test pieces shall be similarly and simultaneously treated with the material before testing.

For both cold and temper bends the test pieces shall withstand, without fracture, being doubled over until the internal radius is equal to $1\frac{1}{2}$ times the thickness of the test piece, and the sides are parallel.

For small sectional material these bend tests may be made from the flattened bar.

Bend tests may be made either by pressure or by blows.

9. **Number of Bend Tests.**—A cold or temper bend test shall be made from each plate or bar as rolled, and these tests shall be in about equal numbers from each charge; but a cold bend test shall be made from all plates which are specially marked for cold flanging.

10. **Tests for Manufactured Rivets.**—Rivets selected by the Surveyor from the bulk shall withstand the following tests :—

(*a*) The rivet shanks are to be bent cold, and hammered until the two parts of the shank touch in the manner shown in Fig. 1, without fracture on the outside of the bend.

(*b*) The rivet heads are to be flattened, while hot, in the manner shown in Fig. 2, without cracking at the edges. The heads are to be flattened until their diameter is $2\frac{1}{2}$ times the diameter of the shank.

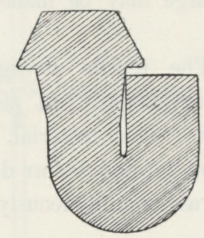


FIG. 1.

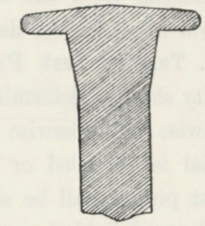


FIG. 2.

11. **Additional Tests before Rejection.**—Should any of the test pieces first selected by the Surveyor not fulfil the test requirements, two further tests may be made from the same plate or bar, but should either of these fail, the plate or bar from which the test pieces were cut shall be rejected. In all such cases further tests shall be made before any material from the same charge can be accepted.

12. **Branding.**—Every plate and bar shall be clearly and distinctly marked by the Maker in two places with the Society's brand, thus :— indicating that the material has complied with the Society's tests.

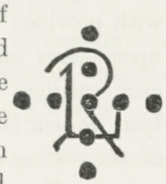
No plates or bars bearing this brand shall be forwarded from the Steel Works until the prescribed tests have been made by the Surveyor, and the mill sheets have been signed by him. All plates and bars shall also be legibly stamped in two places with the Maker's name or trade mark and the place where made. They shall also be stamped with numbers, or identification marks, by which they can be traced to the charge from which the material was made.

13. **Maker's Certificate.**—Before the mill sheets are signed by the Surveyor the Maker shall furnish him with a certificate guaranteeing that the material has been made by the Open Hearth process, and that it has been subjected to, and withstood satisfactorily, the tests above described, in the presence of the Surveyor. The following form of certificate

will be accepted if printed on each mill sheet with the name of the firm, and initialled by the Test House Manager :—

> "We hereby certify that the material described below has been made by the Open Hearth process, and is that which has been satisfactorily tested in the presence of the Surveyor in accordance with the Rules of Lloyd's Register."

14. **Rejected Material.**—In the event of the material failing, in any case, to withstand the prescribed tests, the Surveyor shall see that the Society's brand stamped on the plates and bars by the Maker has been defaced by punch marks extending beyond the brand in the form of a cross, thus :—



denoting that the material has been rejected.

15. **Facilities for Inspection.**—The Maker shall adopt a system of marking the ingots, billets, slabs, plates, bars, etc., which will enable all finished material to be traced to the original charge, and the Surveyor must be given every facility for tracing all plates and bars to their respective charges, and for witnessing the required tests. When he is satisfied with the material and with the results of the tests, he shall be furnished with two copies of the advice notes of the material for his signature, one of which is to be forwarded by the Manufacturer to the Shipbuilder, and the other is to be forwarded by the Surveyor to the Surveyors at the port where the vessel is to be built.

16. **Steel not produced where Rolled.**—Where steel is not produced in the works at which it is rolled, a certificate shall be supplied to the Surveyor stating the Open Hearth process by which it was made, the name of the Steel Maker who supplied it, also the numbers of the charges, for reference to the books of the Steel Maker. The number of the charge shall be marked on each ingot or billet for the purpose of identification, and the finished plates and bars shall also be legibly stamped in two places with the maker's name or trade mark and the place where made. They shall also be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

17. **Occasional Attendance at Steel Works.**—When the Society's Surveyor is not in constant attendance at the Steel works, the Makers themselves may, with the written authority of the Society, comply with all the foregoing requirements, and shall furnish the Surveyor with a certificate to the effect that the Society's Rules as to the testing of steel have been complied with in the case of the material submitted for approval. The Surveyor shall then make check tensile, cold, and temper bend tests from not less than one plate or bar in every batch of 50 or less number, provided the batch be all from one charge. If more than one charge is represented, each charge shall be tested. Additional tests shall also be made for every variation in thickness of ·15 of an inch made from one charge. The test pieces shall be selected by the Surveyor from the plates or bars, and not from shearings previously detached from them, and when marked by the Surveyor for testing they shall be followed, as far as practicable, through the different stages of preparation until the tests are completed.

Should the tests be unsatisfactory, the whole of the material from the charge shall be rejected, and the Surveyor shall see that the Society's brand is satisfactorily defaced.

18. **General.**—Besides the foregoing tests, samples of all material may be subjected to additional tests at the discretion of the Surveyors.

19. In cases wherein it may be desired by Owners and Builders, consideration will be given by the Committee to proposals for the use of steel of other tenacity than is provided for in the foregoing Rules.

QUALITY AND TESTING OF STEEL CASTINGS.

Section 4. 1. **Process of Manufacture.**—Steel for castings shall be made by the Open Hearth process, Acid or Basic, or by such other process as may be approved by the Committee.

2. **Annealing.**—All steel castings shall be thoroughly annealed in a properly constructed annealing furnace, which must permit of the whole casting being uniformly raised in temperature throughout its whole extent to the necessary intensity required for annealing purposes. The casting shall be allowed to cool down prior to removal from the annealing furnace; and if subsequently heated for any purpose it shall again be similarly annealed if required by the Surveyor.

3. **Testing and Inspection.**—The following tests and inspections shall be made, preferably at the place of manufacture prior to despatch, but in the event of any casting proving unsatisfactory in the course of preparation or fitting in the ship, such casting shall be rejected, notwithstanding any previous certificate of satisfactory testing.

4. **Tensile and Bend Test pieces.**—The tensile strength and ductility shall be determined from standard test pieces, which are to be prepared from sample pieces cast on the

casting. These sample pieces are not to be cut, or partially cut from the castings until the annealing of such castings has been completed, nor until they have been stamped by the Surveyor. The test pieces are to be stamped by the Surveyor after the annealing. All test pieces shall be selected by the Surveyor and tested in his presence, and he shall satisfy himself that the conditions herein described are fulfilled.

5. **Number of Tests.**—At least one tensile test and one cold bend test are to be taken from each casting. In castings of complex design, referred to in paragraph 12, at least two tensile and two cold bend tests are to be taken. Where a casting is made from more than one charge of steel, at least four tensile and four cold bend tests are to be taken from pieces cast as far apart as possible on the casting, some test pieces being taken from as near the top and others from as near the bottom of the casting as practicable.

6. **Dimensions of Tensile Test pieces.**—The tensile test pieces are to be turned so as to have a diameter of ·564 inch with a gauge length of 2 inches, or a diameter of ·798 inch with a gauge length of 3 inches, or a diameter of ·977 inch with a gauge length of $3\frac{1}{2}$ inches.

7. **Dimensions of Bend Test pieces.**—The bend test pieces are to be machined to a rectangular section 1 inch wide by $\frac{3}{4}$ inch thick, with the edges rounded to a radius of $\frac{1}{16}$th of an inch. They are to be bent over the thinner section. The bending may be performed either by pressure or blows.

8. **Tensile Tests.** — The tensile breaking strength determined from test pieces of standard dimensions is to be between the limits of 26 and 35 tons per square inch, with an elongation of not less than 20 per cent. measured on the standard test piece.

9. **Bend Tests.**—The bend test pieces must withstand, without fracture, being bent cold through an angle of 120 degrees, the internal radius of the bend being not greater than one inch.

10. **Additional Tests before Rejection.**—Should either the tensile or bend test, or both, fail, and the Surveyor consider the fractured test piece or test pieces, or the results obtained therefrom, do not fairly represent the quality of the casting, a duplicate of the test or tests which failed shall be made if requested by the Maker. In such cases the quality of the casting shall be judged by the result of the duplicate test or tests and not by the original test or tests which failed.

11. **Percussive Tests.**—Stern frames cast in one piece to be let fall on hard ground (excavations being made to take bosses and other projections) after being raised through an angle of 45 degrees. Stern frames cast in more than one piece, rudders, steering quadrants, crossheads, tillers, etc., are to be dropped on hard ground from a height of from 7 to 10 feet according to the design, shape, and weight of the casting.

12. **Castings of Complex Design.**—Castings of complex design which would be liable to be deformed if submitted to the drop or percussive test, may have this test dispensed with provided two tensile and two cold bend tests be made upon pieces taken from positions as far apart as possible on each casting; one tensile and one bend test being taken from as near the top, and the others from as near the bottom of the casting as practicable.

13. **Hammering Tests.**—After being subjected to the percussive test, the casting in each case is to be subsequently slung up and well hammered with a sledge hammer not less in weight than 7 lbs., to satisfy the Surveyors that the casting is sound and without flaw. This hammering test is also to be applied to castings of complex design which may not have been submitted to a percussive test.

14. **Drilling Tests.** In the case of large steel castings the Surveyors are to supplement the foregoing tests by drilling small holes at such parts of the castings as experience shows cavities and contraction cracks are most likely to occur, and at positions which are to be agreed upon between the Surveyor and the Manufacturer, in order to determine the soundness or otherwise of the casting. These holes are afterwards to be tapped and properly filled up with screw plugs.

15. **Branding.**—Every casting after it has satisfactorily withstood the prescribed tests, shall be clearly and distinctly marked by the Society's Surveyor indicating that the casting has complied with the Society's requirements.

QUALITY AND TESTING OF INGOT STEEL FORGINGS.

Section 5. 1. **Process of Manufacture.**—Ingot steel for forgings shall be made by the Open Hearth process, Acid or Basic, or by such other process as may be approved by the Committee.

The forgings must be sound, they are to be made from sound ingots, and must be gradually and uniformly forged. The sectional area of the body of the forging (as forged) shall not exceed one-fifth of the sectional area of the original ingot, and no part of the forging (as forged) shall have more than two-thirds of the sectional area of the original ingot.

2. **Annealing.**—All important ingot steel forgings shall be thoroughly annealed in a properly constructed annealing furnace, which must permit of the whole forging being

uniformly raised in temperature throughout its whole extent to the necessary intensity required for annealing purposes. If the forging be subsequently heated for any further forging it shall again be similarly annealed, if required by the Surveyor.

3. **Testing and Inspection.** — The following tests and inspections shall be made, preferably at the place of manufacture prior to despatch, but in the event of any forging proving unsatisfactory in the course of preparation, or fitting in the ship, such forging shall be rejected notwithstanding any previous certificate of satisfactory testing.

4. **Tensile and Bend Test Pieces.** — The tensile strength and ductility shall be determined from standard test pieces, which are to be prepared from sample pieces cut lengthwise from the forging, from a part of not less sectional dimensions than the body of the forging. Such standard test pieces shall be machined from the sample pieces without forging down, and the sample pieces shall not be detached from the forging until the annealing of such forging has been completed. The test pieces are to be stamped by the Surveyor after the annealing. All test pieces shall be selected by the Surveyor and tested in his presence, and he shall satisfy himself that the conditions herein described are fulfilled.

5. **Number of Tests.**—At least one tensile and one cold bend test are to be taken from each forging. Where a number of articles are cut from one forging, one tensile and one cold bend test from this whole forging will be sufficient.

6. **Dimensions of Tensile Test Pieces.**—The tensile test pieces are to be turned so as to have a diameter of ·564 inch with a gauge length of 2 inches, or a diameter of ·798 inch with a gauge length of 3 inches, or a diameter of ·977 inch with a gauge length of $3\frac{1}{2}$ inches.

7. **Dimensions of Bend Test Pieces.**—The bend test pieces are to be machined to a rectangular section 1 inch wide by $\frac{3}{4}$ inch thick, with the edges rounded to a radius of $\frac{1}{16}$th of an inch. They are to be bent over the thinner section. The bending may be performed either by pressure or by blows.

8. **Tensile Tests.** — The tensile breaking strength determined from test pieces of standard dimensions is to be between the limits of 28 and 32 tons per square inch, with an elongation on the standard test piece of not less than 29 per cent. for 28 ton steel, and 25 per cent. for 32 ton steel, and in no case must the sum of the tensile breaking strength and corresponding elongation be less than 57.

9. **Bend Tests.**—The bend test pieces must withstand without fracture being bent cold through an angle of 180 degrees, the internal radius of the bend being not greater than $\frac{1}{4}$ inch.

10. **Additional Tests before Rejection.**—Should either the tensile or bend test, or both, fail, and the Surveyor consider the fractured test piece or test pieces, or the results obtained therefrom, do not fairly represent the quality of the forging, a duplicate of the test or tests which failed shall be made if requested by the Maker. In such cases the quality of the forging shall be judged by the result of the duplicate test or tests and not by the original test or tests which failed.

11. **Branding.**—Every forging, after it has satisfactorily withstood the prescribed tests, shall be clearly and distinctly marked by the Society's Surveyor indicating that the forging has complied with the Society's requirements.

12. **General.**—The requirements as to annealing and testing are intended to apply to rudder heads and main pieces of rudder upon which arms are shrunk. They are not intended to apply to small forgings which during their last stage of manufacture are uniformly heated throughout.

(*For List of Steel Manufacturers, see pages* 99 *to* 108.)

STANDARD SECTIONS.

Section 6. The Sections of steel materials given in the following Rules are, with few exceptions, Standard Sections (*see* pages 109 to 113), and the thicknesses given in the Tables for the several Sections are the thicknesses of their webs.

IRON WHERE USED INSTEAD OF STEEL.

Section 7. The rivets, keel, stem, stern-frame, rudder, pillars and lining pieces, also the floors, girders and top plating of double bottom in boiler space may be of iron of the sizes given by the Rules. Deck plating and ordinary floors, also the floors, girders, and top plating of double bottoms in holds, coal bunker, and other bulkheads, shaft tunnels, casings round engines, hatchway coamings, bulwarks and deck houses may be of iron 10 per cent. in excess of the thicknesses in steel where scantlings for the same are provided for in the Rules. No other parts of the vessel are to be of iron without the special sanction of the Committee. Iron where used is to be of good malleable quality, and subjected to tests in the shipyard when considered necessary by the Surveyor.

WORKMANSHIP.

Section 8 1. The **Workmanship** to be well executed, and submitted to the closest inspection, and amended where necessary before coating or painting.

2. It is recommended that the black oxide or "mill-scale" be removed from the surfaces before coating or painting, which should be delayed as long as practicable.

3. Experience has shown that, as regards durability, it is highly desirable to place steel vessels in dry dock within a reasonably short time after being launched, for the purpose of cleaning and re-coating the bottom.

4. It is recommended that when plates are one inch and above in thickness the edges, as well as the butts, be planed before the rivet holes are punched.

KEEL, STEM, STERN AND PROPELLER POSTS.

Section 9. 1. The **keel, stem, stern,** and **propeller posts** are to be either scarphed or welded together, and to be in size according to **Table 1**; if scarphed, the length of scarphs to be nine times the thickness given in the Table; and the rivet-holes required in the *thin* ends of them are to be drilled after the scarphs are fitted.

Where stern-frames are in more than one piece, the length of the scarphs should not be less than three times the width of the stern-posts, and the breadth one and a half times the width of the stern-posts, secured by not less than four rows of rivets.

2. Where **Flat Plate Keels** are adopted, their breadth and thickness are to be as given in **Table 17**, and where such keels are used, intercostal keelson plates, or vertical centre-plates, must be fitted close down on the keel-plate, and connected to it by double angles of the dimensions given in **Table 6**, riveted all fore and aft to the keel-plate and keelson. For flat keel angles in double bottoms *see* **Table 8.**

3. The **stem** at its lower part is to be the same moulding as the keel, and attached to it by a scarph of the same length as the keel scarph; it may be gradually reduced from the height of the load-line to its head, where it may be three-fourths of the sectional area given in **Table 1.**

4. The lower portion of the stern-post forming part of the keel in sailing vessels, paddle steamers, and twin screw steamers having no aperture for propeller, is to extend sufficiently forward for the after end of its scarph to be at least once and a half the frame space forward of the stern-post, and the stern-post may be reduced from the lower part of the rudder trunk to its head where it may be three-fourths of the sectional area given in **Table 1.**

5. The lower portion of the stern-frame adjoining the keel in single screw vessels is to be tapered fairly into the keel, and to extend sufficiently forward for the after end of its scarph to be at least twice and a half the frame space forward of the propeller-post; the rudder-post may be reduced from the lower part of the rudder trunk to its head, where it may be of the size given for stems in **Table 1.**

6. **Connection to Transom-plate.**—The **stern-post** is to be extended sufficiently above the counter to be connected to the whole depth of the transom-plate by two vertical angles of the thickness of the transom-plate, which is to be fitted close against the stern-post. The transom-plate is to be of the thickness of the bottom plating at ends, and its depth not less than six times the thickness of "stern-frames with apertures." In screw steamers whose longitudinal number is 16,000 and above the foremost or propeller post should extend sufficiently above the arch of the stern-frame to be efficiently connected to plating on the beams, and to a deep transom-plate.

7. In single screw steamers above 350 ft. in length the after lengths of shell plating are to be connected to the portion of the stern-frame below the boss with three rows of rivets.

8. **Rudder-braces** or **gudgeons** are to be forged on the stern-post, and spaced as given in **Table 24.** The upper gudgeon should be as near as practicable to the rudder trunk. The gudgeons are not to be less in depth than seven-tenths the diameter of the rudder head, and the thickness one-half the diameter of the pintles.

9. When **cast steel stern-frames** are fitted they are to be tested as described in **Section 4.** Sketches of the proposed castings are to be submitted for the approval of the Committee.

RUDDERS.

Section 10. 1. **For the diameters** of rudder heads *see* **Table 22.**

2. **For the scantlings** of rudders, coupling bolts, quadrants, tillers, and steering chains, *see* **Tables 23, 24** and **25.**

3. Forged rudder heads, frames, arms, pintles, gudgeons and crossheads, and tillers are to be of the best hammered iron or steel. For quality and testing of Ingot Steel Forgings, *see* **Section 5.**

4. When cast steel rudders, steering quadrants, crossheads, tillers, etc., are fitted they are to be tested as described in **Section 4.**

5. **Couplings.**—Where rudder heads are coupled the dimensions of the bolts and flanges or palms should not be less than required by **Table 23**, and the width of the material outside the bolt holes should not be less than two-thirds the diameter of the bolts. The nuts are to be in proportion to the size of the bolts, and locking plates, split pins, or other efficient means are to be adopted to prevent them from turning. A key or feather is to be fitted in horizontal and vertical couplings. The thickness of the tips of the palms of scarphed couplings is to be ·13 of the diameter of the head. (*See* **Sketches** on page 115.)

Where the form of the coupling is modified from that contemplated by the Tables the strength is to be equivalent to that required by the Rules.

6. **Pintles.**—The pintles are to be spaced as given in **Table 24**, and the top pintle should be as near as practicable to the rudder trunk. The pintles should be at least the full length of the gudgeons, and it is recommended they be made independent of the frame.

7. **Double Plate Rudders.**—The frame and main piece of **double plate rudders** must be efficiently forged and stayed at intervals corresponding with the pintles. The main piece is to have a straight taper from below the top pintle to the heel where it is to be of the size required by **Table 24.** The sectional area at the top pintle is to be not less than that of the rudder head.

8. **Single Plate Rudders.**—The main piece of **single plate rudders** is to have a straight taper from below the top pintle to the heel where it is to be of the size required by **Table 24.** The sectional area at the top pintle is to be not less than that of the rudder head. The arms to be fitted alternately on opposite sides of the plate. Fillets to arms forged or cast on the main piece are not to have a less radius than one-fifth the distance between the arms. Where arms are shrunk upon and keyed to the main piece, the latter is to be increased in diameter in way of each arm to admit of an efficient key-way being cut.

9. **Rivets.**—The rivet holes in rudder plates and arms are to be countersunk and the rivets are to have full heads and points.

FRAMES AND REVERSED FRAMES.

Frames.

Section 11. 1. The **frames** to be of the dimensions set forth in **Tables 2, 3** and **5,** and to extend from the keel to the gunwale. They are to fit closely to the upper edge of the keel ; and the after frames should be sufficiently apart transversely to admit of sound riveting and workmanship. At the extreme ends of the vessel the lower parts of the frames opposite to each other are to be lapped and riveted together. In raised quarter-decks, bridges, poops, or fore-castles, the frames are to extend to their deck stringers respectively.

2. **Heel Bars.**—When the frames are butted on the keel they are to have not less than 3 feet lengths of corresponding angle bars, fitted back to back, to cover and support the butts and be attached to the plating for at least three-fourths the vessel's length amidships. Similar pieces of angle bar are to be fitted if the frames are butted elsewhere.

3. The **rivet holes** to be punched from the faying surfaces of the frames, and they are not to be punched at the turn of the bilge until the frames are bent to the required shape ; the holes in the way of the lands of the plating are to be drilled or " beared " after the frames are faired in place, and the plate edges lined off.

4. **Spacing.**—The spacing of the frames from centre to centre to range from 20 to 33 inches, according to the size of the vessel, and to be as required by **Tables 2, 3** and **5.** The spacing amidships should not be exceeded around the stern of the vessel at the knuckle. In no case is the frame spacing to exceed 27 inches between the collision bulkhead and one-fifth the vessel's length from forward unless the frames are doubled to the height of the lowest tier of beams, and in the peaks the frame spacing is not to exceed 24 inches.

When a spacing of frames greater than that provided for in the Tables is adopted, the transverse framing, floors, inner bottom, beams, outside plating and deck plating, are to be proportionately increased.

5. When the **height between deck stringers** at the sides exceeds 8 feet at any part, additional transverse strength at such part must be submitted for approval. Where the frames are formed of frames and reversed frames, bulb angles, or channel bars without reversed frames, and the beams of the lowest tier are widely spaced, the height between the widely spaced beams and the deck above is not to exceed the depth for framing (**d**). Where, however, this height exceeds 9 feet, a side stringer, of the same scantlings as required to be fitted below is to be fitted midway between the widely spaced beams and the deck above, or other equivalent strengthening is to be introduced.

Reversed Angles on Frames.

6. **Reversed angles on floors and frames** to be in size as per **Tables 2, 3 and 5.**

7. **Height of Reversed frames.**—Where one tier of beams, only, is fitted and the depth (**d**) is 7 feet and under 9 feet, the reversed frames are all to extend to the upper turn of bilge.

When the depth (**d**) is 9 feet and under 11 feet, the reversed frames are to extend to upper turn of bilge and side stringer alternately.

When the depth (**d**) is 11 feet and under 13 feet, they are to extend to side stringer and upper deck stringer plate alternately.

When the depth (**d**) is 13 feet and under 27 feet, all the reversed frames are to extend to the upper deck stringer plate.

8. Where more than one tier of beams are fitted in steamers, and the height of 'tween decks does not exceed 8 feet the reversed frames are to extend to the upper deck stringer plate and deck stringer plate next below alternately.

Where the height of 'tween decks exceeds 8 feet, or where an awning or shelter deck or long bridge is fitted, the framing in the 'tween decks or the height to which the reversed frames should extend will be specially considered.

9. When the framing consists of channel bars with reversed frames, the latter are to extend to the lower edge of the beams at the lowest deck.

10. Where the beams in the lowest tier are widely spaced, the reversed frames are to extend at least to the deck above on all frames.

11. **Overlap of Frames upon Reversed frames.**—Where the frames and reversed frames are connected with $\frac{5}{8}$ inch rivets the overlap of frame upon reversed frame is to be not less than $2\frac{1}{4}$ inches. Where $\frac{3}{4}$ inch rivets are used the overlap is to be not less than 3 inches, and where $\frac{7}{8}$ inch rivets are used the overlap is to be not less than $3\frac{1}{2}$ inches.

12. **Double reversed angles** are to be fitted on every floor, extending from bilge to bilge in the engine and boiler spaces of steam vessels; and where the longitudinal number is 11,000 or above, they are to extend sufficiently high to admit of the stringer at upper part of bilge being connected to them.

Short double reversed angles are to be fitted on all floors in the way of the keelsons, connected by not less than three rivets to the floor.

13. **Additional Reversed Frames and Stringers.**—In vessels where the longitudinal number is 15,000 and above, reversed angles should be fitted to every frame to the height of the upper deck, abaft the after peak bulkhead. Where such vessels have broad flat counters, a double angle stringer should be fitted to the framing in the 'tween decks for a reasonable length, connected by plate knees to the transom plate; or other additional strengthening applied, as the Surveyors may deem necessary.

14. **In top-gallant forecastle** of vessels whose longitudinal number is 14,000 and above, the alternate reversed frames are to extend to the forecastle deck, or other efficient means of strengthening the forecastle may be adopted, if approved by the Committee.

FLOOR-PLATES.

Section 12. 1. The **floor-plates** to be in size at the middle line according to **Table 4**, excepting in the engine space in steam vessels, where they must be ·04 of an inch thicker, and in the boiler space ·10 of an inch thicker.

2. The floor-plates are to be **moulded** not less than one-half their midship depth at a distance of three-quarters the half breadth of the vessel set out from the middle line on the run of the frame, and not less at their extreme ends than the moulding of the frames; and they are to extend in a fair curve well up the bilges, in no case terminating lower at the outside of the frame than a perpendicular height above the top of keel of twice the midship depth of the floor as fitted. In vessels of unusually fine or full form the moulding is to be modified to the approval of the Committee.

The ends of the floors to maintain the height prescribed for one quarter of the vessel's length amidships. They may then be gradually lowered forward and aft until the upper edges of the floor-plates are level (this place to be determined by the form of the vessel), from which to the ends they are to be gradually increased in depth, so as to efficiently connect the sides.

3. A floor-plate to be fitted and riveted to every frame, and to be extended across the middle line, except where a vertical centre-plate is adopted, in which case the floor-plates are to be efficiently connected to it on each side by double

vertical angles of the thickness of the centre plate and with flanges not less than $2\frac{1}{2}$ inches for $\frac{5}{8}$ inch rivets, 3 inches for $\frac{3}{4}$ inch rivets, and $3\frac{1}{2}$ inches for $\frac{7}{8}$ inch rivets.

4. **When in two lengths.**—When floors are made in two lengths, the butts are to be riveted in accordance with the requirements of **Table 21.**

5. Floor-plates to which the bulkheads are attached must be deeper than the adjacent floor-plates, to admit of the bulkheads being riveted to them above the reversed angle bars.

6. In the **after peak of steam vessels** the floors are to extend well above the stern tube, and in vessels of full form where the extension of the floor-plate may not be practicable, broad cross tie-plates are to be fitted above the stern tube, stiffened with angles or flanged on both upper and lower edges. Stringer plates are also to be fitted at this part connected to the outside plating. The floors and cross-tie-plates in the after peak are to be connected to the frame angles with rivets spaced not more than five diameters apart.

7. **Watercourses** are to be formed above the frames through all the floor-plates on each side of the middle line, also at the lower turn of the bilges in vessels of full form, as well as through the vertical centre-plate, and intercostal keelsons, when such keelsons are adopted, so as to allow water to reach the pumps freely.

8. **Transom-plates** are to be fitted and connected to the frames, and to the stern-post, so as to efficiently support the counter. (*See* **Section 9, paragraph 6.**)

WEB FRAMES.

Section 13. 1. **Web Frames**, six frame spaces apart, in conjunction with **side stringers** in hold and intermediate transverse frames, may be fitted, if arranged in accordance with **Table 5** and with the conditions specified below (*See* **Sketches** on pages 117 to 119) :—

The depth (**d**) for regulating the scantlings of web frames, and the number of the side stringers required to be fitted, is to be taken from the top of the floors to the top of the beams of the lowest laid deck at side.

2. Face angles of the size given in **Table 5** are to be riveted on the inner edge of the web frames and side stringers.

3. The double angles connecting the stringers to the web frames and the angles connecting the stringers and web frames to the outside plating are to be of the thickness of the web frames and with flanges—

4 inches	×	4 inches	for	1-inch	rivets.	
$3\frac{1}{2}$	,,	×	$3\frac{1}{2}$	,,	$\frac{7}{8}$	,,
3	,,	×	3	,,	$\frac{3}{4}$	,,

Where the depth of web frame is 24 inches or above, the web frames are to be attached to the outside plating by double angles or by equivalent single angles double riveted. Where the transverse number is 111 or above, the stringer plates are to be attached to the outside plating with double angles for a length of three frame spaces on each side of the bulkheads.

4. **Butt straps** of the form shown by **Sketches** on pages 117 to 119, are to be fitted at the junction of web frames and side stringers, and are to be of the scantlings given in **Table 5.**

5. The **deck beams** are to be attached to the web frames at their head by bracket knees of the thickness of the web frames flanged on their inner edge. The breadth and depth of these knees are to be equal to the depth of the web frame, and they are to be measured from the lower edge of the beam and the inner edge of the web frame. The knees are to be double riveted in each arm.

6. The side stringers are to be supported by a **bracket knee plate** of the same thickness as the stringers fitted midway between the web frames when the depth of web frame is 16 inches and under 18 inches, and where this depth is 18 inches and above, the brackets are to be fitted to alternate frames.

7. The length of frame extending above a web frame is to be of the same strength as the intermediate frames.

8. In **single deck vessels** framed with web frames all the reversed frames are to extend to the upper deck stringer plate.

9. Where more than one tier of beams are fitted in steamers having web frames and the height of 'tween decks does not exceed 8 feet the reversed frames are to extend to the upper deck stringer plate and beam stringer plate below, alternately. Where the height of 'tween decks in such vessels exceeds 8 feet or where a long bridge, awning or shelter deck is fitted, the height to which the reversed frames should extend or the framing in the 'tween decks will be specially considered.

10. The distance between stringers or between the lowest stringer and top of floors at centre in way of single bottoms, and top of margin plate in way of double bottoms, is not to exceed 8 feet at any part of the vessel.

KEELSONS.

Section 14. 1. The **scantlings** and **arrangements** of keelsons are to be as required by **Table 6** and shown by **Sketches** on pages 120 to 122.

2. When keelsons are formed of **vertical plate and four angles** the broader flanges of the upper angles are to be fitted horizontally, and there is to be a rider plate on the top of the same thickness as the vertical plate, and one inch broader than the sum of the horizontal flanges of the angles.

3. The bottom angles of **keelsons** are to be **attached to the reversed frames** and to short double reversed frames fitted in way of the keelsons connected by not less than three rivets to the floors. When these double reversed frames form butt straps for the ordinary reversed frames there should be at least three rivets on each side of the butt.

4. **Continuity.**—It is recommended that keelsons be carried fore and aft continuously through the bulkheads, the latter being made watertight around them, and, when such parts of the ship are necessarily separated the longitudinal strength is to be efficiently maintained to the satisfaction of the Surveyors. When keelsons, or other longitudinal strengthening, are required for a certain portion of the length of a vessel, care should be taken to overlap or properly shift the ends of the same so as to avoid any abrupt termination of strength.

5. **Butt Connections.**—All angle and bulb angle bars of keelsons are to be in long lengths, properly shifted, and wherever butted, to be connected with angles not less than 2 feet long, fitted in the throat of them, properly riveted to each flange. The thickness of the connecting straps is not to be less than the thickness of the angle bars they connect. The butts of the plates of keelsons are to be properly shifted and riveted as required by **Table 21.** The butts of the vertical plates are to be secured with double butt straps, each not less than ·14 of an inch thicker than half the thickness of the plates they connect, or the butts may be overlapped.

6. **All Middle Line Keelsons** are to extend as far forward and aft as practicable; the rider plates need not, however, extend beyond ¾ the vessel's length amidships.

7. **Middle Line Keelsons standing upon floors** may be formed of double bulb angles when the longitudinal number is under 4,700, when the longitudinal number is 4,700 and under 26,000 the keelson is to be formed of a vertical plate, four angles and rider plate, and when the longitudinal number is 26,000 and above, a foundation plate 18 inches by ·50 of an inch is to be fitted on the top of the floors.

8. When **Flat Plate Keels** are adopted, intercostal or centre through plate keelsons must be fitted.

9. **Middle Line Keelsons with Intercostal Plates.**—The intercostal plates are to be attached to the floors by double angles of the thickness of the intercostal plates, and with flanges not less than $2\frac{1}{2}$ inches for $\frac{5}{8}$-inch rivets 3 inches for $\frac{3}{4}$-inch rivets, and $3\frac{1}{2}$ inches for $\frac{7}{8}$-inch rivets.

10. **Centre Through Plate Keelsons.**—The centre through plate is to be of the thickness given in **Table 6,** and a foundation plate not less than 24 inches in width and of the same thickness as the centre through plate is to be fitted on the top of the floors, and attached to the centre girder by continuous angles, or the centre through plate may be extended above the top of the floors, and a foundation plate fitted on each side not less than 12 inches in width. Where the longitudinal number is 10,000 and under 17,200, double bulb angles of the size given in **Table 6** are to be fitted above the foundation plates and attached to the centre through plate, and where the longitudinal number is 17,200 and above, the centre through plate is to extend above the floors to the height given on **Table 6,** and in addition to the foundation plates, four angles of keelson size are to be fitted with a rider plate of the same thickness as the centre through plate.

11. **Side Keelsons** are to be fitted with intercostal plates attached to the outside plating by angles of the thickness of the intercostal plates, and with flanges not less than $2\frac{1}{2}$ inches for $\frac{5}{8}$-inch rivets, 3 inches for $\frac{3}{4}$-inch rivets, and $3\frac{1}{2}$ inches for $\frac{7}{8}$-inch rivets.

12. When the breadth of the vessel is under 27 feet, a **side keelson** is to be fitted on each side extending as far forward and aft as practicable.

13. Where the breadth is 27 feet and under 50 feet **two side keelsons** are to be fitted on each side extending as far forward and aft as practicable. If these keelsons are formed of plate, four angles and rider plate, the depth of the vertical plate of the keelson nearest the middle line may be gradually reduced beyond three-fourths the vessel's length

amidships to the breadth of the flanges of the lower angles, and the rider plate need not extend beyond the three-fourths length. The depth of the vertical plate of the outer **side keelson** may be similarly reduced beyond three-fifths the vessel's length amidships.

14. When the breadth is 50 feet and under 54 feet **two side keelsons** are to be fitted as required in the previous paragraph, and in addition **a bilge keelson** formed of double angles and intercostal plates is to be fitted on each side extending as far forward and aft as practicable.

SIDE STRINGERS.

Section 15. 1. The number of **side stringers** is to be as required by **Tables 2 and 3**, and their scantlings and construction as given in **Table 7**, and shown by the **Sketches** on page 116. For side stringers in conjunction with web frames *see* **Section 13** and **Table 5**.

2. The **spacing of side stringers** at ends of vessels is not to exceed that amidships.

3. The **side stringers** are to be formed of continuous angles fitted on the inside of the frames, or of the reversed frames, and when the depth of framing exceeds 3 inches by **Table 2** and 4 inches by **Table 3**, intercostal plates are to be fitted, attached to the outside plating by angles of the thickness of the intercostal plates, and with flanges not less than $2\frac{1}{2}$ inches for $\frac{5}{8}$-inch rivets, 3 inches for $\frac{3}{4}$-inch rivets, $3\frac{1}{2}$ inches for $\frac{7}{8}$-inch rivets, and 4 inches for 1-inch rivets. The stringer angles are to be attached to each reversed frame, or to angle lugs on the frames with at least two rivets, and connected by brackets to the transverse watertight bulkheads, as shown by the **Sketch** on page 130.

4. **Butt Connections.**—The butts of side stringers are to be properly shifted and the angle bars are to be efficiently strapped at the butts with angles not less than 2 feet in length. The thickness of the angle straps is not to be less than the thickness of the angle bars they connect. The intercostal plates are to be in long lengths and strapped at the butts. (*See* **Sketch** on page 130.)

5. If it should be desired to omit one or more of the side stringers required by this section of the Rules a sketch is to be submitted showing the compensation proposed for such omission.

DOUBLE BOTTOMS AND WATER BALLAST TANKS.

Section 16. 1. **Scantlings and attachments.**—The scantlings and attachments of the various parts forming the double bottom are to be as required by **Tables 8 and 9.**

2. **Side keelsons and part double bottoms.**—Where part double bottoms are fitted the side keelsons are to extend into, or scarph the double bottom, not less than three spaces of frames, and be connected to the longitudinal girders where practicable. Where double bottoms are fitted in the fore and after holds and not extended through the engine and boiler space, care is to be taken to provide against an abrupt termination in the longitudinal strength. The girders are either to be carried through the engine and boiler space, or connected with longitudinal engine and boiler bearers, or otherwise arranged to the satisfaction of the Surveyor.

3. **A "Well" to be formed in the engine-room.**—Where a double bottom extends through the engine and boiler space, a "well" should be formed between the engine-room after bulkhead and the floor immediately before the same, for the drainage of water; or open gutter ways of sufficient size should be made in the wings, so as to be always accessible.

4. **Side girders.**—Side girders in a double bottom are to be extended as far forward and aft as accessibility to all parts will admit. The girder nearest the middle line is to be extended to the collision bulkhead, except where fineness of the form of a vessel renders this unnecessary for the efficient stiffening of the bottom plating.

Where the side girders are spaced more than 6 feet apart the **watertight floors** in double bottom are to be stiffened by vertical angles, of the size of the frame angle on floor, fitted midway between the girders.

5. **Double reversed frames in machinery space.**—Double reversed angles are to be fitted on every floor in engine space, and on each floor in way of boiler bearers. They are to extend in all cases from the middle line to beyond the girder next outside the engine seating.

6. **Free passage of air between divisions.**—It is of importance that ample provision should be made for the free passage of air from one division to another, so that it may readily find its way to the air pipes. This should be done by fitting the liners short, setting down the angle bar from the inner bottom or top of deep tank wherever necessary, and leaving, otherwise, a sufficient number of holes as near to the inner bottom as practicable.

The **air pipes** should also be sufficient in number and size; and, wherever necessary, one should be fitted at each end of each tank on both sides of the vessel.

7. **Tank side brackets and angles.**—Bracket plates are to be fitted outside the double bottom, riveted to the margin

plate and to every frame all fore and aft, and to extend up the bilges to the height given in **Table 8**. The bracket plates are to maintain this height throughout the half length of vessel amidships and thence to fore end of double bottom; but abaft the half length amidships the height may be gradually reduced to the level of the inner bottom at the after end of double bottom.

The breadth of the bracket plate at the ship's side and its rivet attachment to the frame angle must, however, in no case be less than its breadth and attachment at the margin plate. The angle bars connecting outside bracket knees to the margin plate are to be fitted on the same side of the bracket plates as the corresponding angles connecting the floor ends or inside brackets to the margin plate.

8. **Margin plates.**—The margin plate is to be of the depth and thickness required by **Tables 8 and 9**, and is to be efficiently connected to the outside plating and frames of the main body of the vessel. The full depth of the margin plate is to be maintained throughout the midship three-fifths length of the vessel and to the fore part of double bottom, but abaft the midship three-fifths length of the vessel the depth may be gradually reduced to a depth at the after end of 15 per cent. less than the midship depth.

When gusset plates or other ties are fitted connecting the outside bracket knees to the inner bottom, the horizontal flanges of the margin plates are to be of sufficient width to admit of the gusset plates being efficiently fitted and riveted clear of the landing edge of the inner bottom, and the upper surface of the reversed frames on top of the outside bracket knees should be fair with the top of the inner bottom.

9. **Manholes and covers.**—Manholes, with wrought iron or steel covers, must be constructed so as to enable the inner surfaces of outside and inner bottom plating, the frames, floors, girders, and rivets to be thoroughly examined and coated when required, and where the manhole covers are attached by bolts to the inner bottom plating, doubling plates or rims are to be fitted to receive the fastenings of the covers.

Where the manhole covers in the double bottoms of cargo holds, or their fittings, project above the tank top, and the ceiling is omitted, they must be protected by fitting an angle coaming around each manhole with a hatch either of wood or of steel fitted therein.

Manholes are not to be cut in the centre girder within three-fourths the vessel's length amidships. The manholes in the floor plates, side girders, and inner bottom plating are to be no larger and not more numerous than necessary to render all parts of the double bottom readily accessible. The edges of the manholes should be smooth to enable them to be entered with facility.

10. **Workmanship and Testing.**—All watertight joints are to have the surfaces of steel fitted close to each other and caulked, without, as far as practicable, the use of felt, canvas, &c. The double bottom is to be caulked and made watertight, and each compartment intended for water ballast is to be tested on completion with a head of water to the height of the load water line.

Where **deep water ballast tanks** are fitted their watertightness is to be tested by a head of water 8 feet above the top of the tank, but not less in any case than to the height of the load water line.

A **wash plate** is to be fitted in the **peaks** when used for water ballast, and the tanks are to be tested by a head of water 8 feet above the top of tank, but not less in any case than to the height of the load water line.

11. **Alternative arrangements.**—Any other plan of fitting double bottoms than those hereafter referred to may be adopted, provided in the first instance it receives the approval of the Committee.

12. **Peak Tanks.**—Attachment where frames and reversed frames are cut at the tops of peak tanks of ordinary length :—

Transverse Number.	Depth of bracket measured from outside plating.	Number of Rivets.
23 and under 42	15 inches.	4 of $\frac{5}{8}$ inch.
42 " " 54	18 "	4 " $\frac{3}{4}$ "
54 " " 63	21 "	5 " $\frac{3}{4}$ "
63 " " 75	24 "	6 " $\frac{3}{4}$ "
75 " " 87	27 "	7 " $\frac{3}{4}$ "
87 " " 99	30 "	7 " $\frac{7}{8}$ "

Brackets are to be fitted at every frame of the same thickness as the frame, and are to be attached to the tank top plating by means of single angles of the size required for lower deck stringer angles.

Where only the reversed frames are cut, and not the frames, the bracket attachments as above are to be fitted to alternate frames.

Cellular Double Bottoms with a Floor Plate fitted at Every Frame.

13. **Construction.**—Where double bottoms are constructed with floor plates, lightened with manholes, fitted to every frame, and continuous in one length from the middle line to the margin plate, intercostal side girders are to be

fitted between the centre girder and margin plate, in accordance with the requirements of **Table 8**, well connected to the floors and to the inner and outer bottom plating.

14. **Additional girders in way of engines.**—Additional intercostal girders are to be fitted in way of the engine seating.

15. **Inner bottom plating.**—The inner bottom plating is to be continuous and wrought longitudinally. The butts to be shifted well clear of each other and the edges to be shifted well clear of the girders.

16. **Outside plating.**—The outside plating (except flat keel plates and garboard strakes) which is entirely within the boundary of a double bottom having floors fitted at every frame, and which does not exceed ·66 of an inch in thickness amidships, may be reduced ·02 of an inch where the plating is ·52 of an inch in thickness, ·04 of an inch where the plating is ·54 and not more than ·64 of an inch in thickness, and ·02 of an inch where the plating is ·66 of an inch in thickness, but where the plating exceeds ·66 of an inch in thickness amidships no reduction will be permitted in the outside plating.

Cellular Double Bottoms with Floor Plates fitted at Alternate Frames.

17. **Construction.**—Where double bottoms are constructed with floor plates lightened with manholes, fitted to alternate frames, side girders are to be fitted in accordance with the requirements of **Table 8**, well connected to the floors and to the inner and outer bottom plating.

In all cases floor plates are to be fitted under the boiler bearers, also to every frame in the engine space and from the three-fifths length amidships to the collision bulkhead.

Where the rule length of vessel exceeds 400 feet, and in single-deck vessels which exceed 26 feet moulded depth, the double bottom is to be constructed throughout with a floor plate at every frame and with longitudinal girders as required for that system of construction.

18. **Intermediate frames and reversed frames.**—Intermediate frames and reversed frames of the size given in **Table 8** are to be fitted for stiffening the outside plating and tank top, unless the longitudinal girders are more closely spaced than required by the Table, or the inner bottom plating be increased ·04 of an inch in thickness when the intermediate reversed angles may be dispensed with.

19. **Bracket plates on intermediate frames.**—Bracket plates are to be fitted to the centre girder and margin plates at the intermediate frames inside the double bottom, and where the longitudinal number is 20,000 and above, the brackets are to be of sufficient breadth at the top to take three rivets in the vertical flange of the intermediate reversed angles, for $\frac{3}{5}$ths the vessel's length amidships.

20. **Stiffeners to Side Girders.**—Vertical angles are to be riveted to the side girders and attached at their ends, by not less than two rivets, to the intermediate frames and reversed frames.

21. **Inner bottom plating.**—The inner bottom plating is to be continuous and wrought longitudinally. The butts to be shifted well clear of each other and of the butts of the longitudinal girders, and the edges to be shifted well clear of the latter.

Double Bottoms Formed with Girders on top of Ordinary Floors.

22. **Construction.**—Where double bottoms are fitted with longitudinal girders extending on top of ordinary floors the girders must be spaced not more than 3 feet apart with a continuous angle on the upper and lower edges, and in addition to be connected by vertical angles on the floors and girders. Side intercostal plates need not be fitted in the range of double bottom except where the breadth of the vessel exceeds 46 feet.

23. **Accessibility.**—The height of the tank top above the floors to be at least sufficient for easy access and examination of the inside of tank.

24. **Floor end brackets.**—Bracket plates are to be fitted inside and outside the double bottom attaching the margin plate to every floor plate and frame.

ADDITIONAL STRENGTHENING OF THE FORE PART OF THE FLAT OF BOTTOM OF STEAMERS OF FULL FORM.

Section 17. 1. **Riveting.**—Before the three-fifths length of a steamer having a tonnage co-efficient of ·76 or having a full form at the fore part the rivets in the plating and frames in way of flat of bottom are to be spaced not more than $5\frac{1}{2}$ diameters apart.

2. **Side girders.**—Where a double bottom is constructed with a **floor at every frame** additional intercostal girders are to be fitted before the three-fifths length of the vessel, of one-half the depth of the centre girder, and extending as far forward as practicable.

Where the double bottom is constructed with **floors at alternate frames** and with the floor plates fitted to every frame forward of the three-fifths length, additional girders need not be fitted at that part provided the ordinary side girders extend as far forward as practicable.

3. **Where there is no double bottom** in the fore part of a steamer of full form intercostal side keelsons are to be fitted between the three-fifths length and the collision bulkhead.

4. **Double Frames.**—The **frames** are to be doubled from the three-fifths length forward to the Rule position of the collision bulkhead, from margin plate to margin plate of double bottoms, or to the turn of bilges where double bottoms are not fitted.

5. **Outside plating.**—The three strakes of outside plating next the keel are to have the midship thickness maintained forward to the collision bulkhead.

COASTING VESSELS INTENDED TO LOAD OR DISCHARGE WHILE LYING ON THE GROUND.

Section 18. In the case of small coasting vessels intended to load or discharge while lying aground, it is recommended that the bottoms be additionally strengthened in order to withstand the exceptional stresses to which they may be subjected.

WATERTIGHT BULKHEADS.

Section 19. 1. **Number of Bulkheads.**—Screw steamers are to have a watertight bulkhead at each end of the engine and boiler space.

A watertight collision bulkhead is, in addition, to be fitted at not less than one-twentieth of the vessel's length abaft the fore part of the stem measured at a point 8 feet below the upper deck, and a watertight bulkhead is also to be fitted at a reasonable distance from the after end of the vessel.

The foremost or collision bulkhead is to extend from the floor plates to the upper, awning or shelter deck, and its water-tightness is to be tested by filling the peak with water to the height of the load line. In very large vessels the height of this bulkhead will receive the special consideration of the Committee.

2. In steamers 285 feet and under 335 feet in length, an additional watertight bulkhead is to be fitted in the main hold about midway between the collision and boiler room bulkheads.

In steamers 335 feet and under 405 feet an additional watertight bulkhead is to be fitted in the after hold.

In steamers 405 feet and under 470 feet seven watertight bulkheads are to be fitted.

In steamers 470 feet and under 540 feet eight watertight bulkheads are to be fitted.

In steamers 540 feet and under 610 feet nine watertight bulkheads are to be fitted.

In steamers 610 feet and under 680 feet ten watertight bulkheads are to be fitted.

Where the machinery is fitted aft in vessels 220 feet and under 285 feet long, a watertight bulkhead is to be fitted about midway between the collision bulkhead and the bulkhead at the fore end of the engine and boiler space.

3. The bulkheads are to extend to the height of the upper deck, except in awning or shelter deck vessels, in which cases the bulkheads, with the exception of the collision bulkhead (*see* par. 1), may extend to the deck next below the awning or shelter deck. In awning or shelter deck vessels, or vessels with a continuous superstructure or bridge house, a deep web frame or partial bulkhead is to be fitted on each side in the 'tween decks, over each of the watertight bulkheads which extend only to the deck next below the awning or shelter deck. Partial bulkheads may be dispensed with if other efficient strengthening is provided to the satisfaction of the Committee.

4. **When a bulkhead is not completed at one pair of frames** from the floor plate up to its prescribed height per rule, but is recessed, stepped, or stopped at an intermediate part, the watertightness is to be completed with collars or chocks forming a "metal to metal" connection, to the exclusion of cement, wood, &c.

The bulkheads to be connected to the decks and to double bottom plating by angles of the sizes given in **Table 10,** and to be extended to the outside plating by a watertight sub-division at or near each bulkhead required by Rule.

5. **Plating.**—The **plating of bulkheads** to be of the thickness prescribed in **Table 10,** attached to each side of the vessel with angles of the sizes given in the Table, and strongly riveted to them, also connected to the floor plates by a double row of rivets.

6. **Bulkhead liners.**—Doubling plates between frames and outside plating in way of bulkheads, are to extend in one piece from the foreside of the frame before to the aftside of the frame abaft the bulkhead frames, or they may be of an approved diamond shape, fitted and

riveted as shown in **Sketch.** (*See* page 130.) These doubling plates may be dispensed with, provided the transverse watertight bulkheads are connected to the sides of the vessel by means of brackets of the dimensions shown by the **Sketch** on page 130, fitted at each side stringer and hold stringer. When one or more of the side stringers are omitted, and bulkhead liners are also omitted, brackets are to be fitted two frame spaces in length on each side of the bulkhead, attaching the transverse watertight bulkheads to the outside plating at such places as the side and hold stringers, provided for in the Rules, would be situated. The brackets are to be ·06 of an inch thicker than the side stringer intercostal plates which would have been required had the side stringer, or stringers, been fitted.

7. **Bulkhead Stiffening.**—The bulkheads to be supported by vertical stiffening of the description and scantlings given upon **Table 10,** and the stiffeners are to be not more than 2 feet 6 inches apart. Bracket plates or other efficient attachments are to be fitted at the heads and heels of all vertical stiffeners except in the upper 'tween decks. (*See* **Sketches** on pages 126 to 129.)

8. The **engine-room bulkheads** are to extend from the floor-plates to the upper deck, except in awning or shelter deck vessels, in which cases they may extend to the deck next below the awning or shelter deck, provided the machinery openings be trunked-in to the height of the awning or shelter deck.

The aftermost bulkhead will be required to extend to the height of the upper deck, unless a different arrangement of bulkheads be approved by the Committee. This bulkhead is to be made watertight by a stuffing box where the screw shaft passes through, and its watertightness is to be tested by the after compartment being filled with water to the height of the load line. The bulkhead plating is to be doubled or increased in thickness in way of the stuffing box.

9. **Caulking.**—All such bulkheads to be caulked and made thoroughly watertight, and to be tested by water from a hose, if considered necessary by the Surveyors, to ensure that they are watertight.

10. **Bulkhead Recess.**—When a recess extending above the hold beams is formed in the engine room bulkheads the bulkhead is to be efficiently connected from side to side by a tie or bridle beam at about the height of the hold beams, strongly riveted to the plating and fitted with efficient gusset plates.

BEAMS.

Section 20. 1. It is recommended that the round up of the beams of all weather decks should be about one quarter of an inch per foot of length of beam, except when the longitudinal number exceeds 30,000 and at least half the length of the top continuous deck is covered by erections.

2. **Form of Beam Section.**—**Beams** are to be of the form and size given in **Tables 11, 12 and 13** (*see* also **Sketches,** pages 109 to 113), or they may be of other approved form of equal strength.

3. The beams of the various decks, or of tiers of beams, are to be placed over each other and, as far as practicable, to be fitted to the frames which have reversed frames extended to the upper deck.

4. **Beams** are to be fitted at **every frame**:—

(*a*) At all watertight flats.

(*b*) At upper decks of single deck vessels above 15 feet in depth.

(*c*) At unsheathed upper decks when a complete steel deck is required by the Rules, also at unsheathed bridge decks, awning or shelter decks. In vessels over 450 feet in length the beams of upper, awning or shelter decks are to be fitted at every frame whether the plating is sheathed or not. Upper decks in way of poops, forecastles, and bridges of vessels less than 66 feet in breadth may have the beams fitted at alternate frames, except for one-tenth the vessel's length within each end of the bridge where they are to be fitted at every frame.

(*d*) Where no wood deck is laid on a steel or iron deck (required by the Rules) at sides of hatchways including those of engine and boiler room openings.

Elsewhere deck beams must in no case be spaced more than two frame spaces apart, and only when the frame spacing does not exceed 27 inches.

5. **Rows of Pillars.**—The number of rows of pillars is to correspond with the requirements of **Tables 11** and **12.** Where the length of the midship beams exceeds 44 ft. not less than two rows of pillars are to be fitted, and where the length exceeds 60ft. three rows are to be fitted. Where beams are at every frame, pillars are to be fitted at alternate beams and attached to continuous fore and aft girders under the beams. These girders are to be attached to each beam and to the bulkheads against which they abut, by short angles. For widely spaced pillars and girders at heads of same, *see* **Tables 15** and **16,** and **Sketches.**

Where **one row of pillars** is fitted, the **beams at the** ends of the vessel which are less in length than two-

thirds that of the beam amidships, may be of the sizes required by the columns numbered 2 in **Tables 11** and **12**; and **beams at ends** less than half the length of the beam amidships may be of the sizes required by columns **3** in **Tables 11** and **12**.

Where **two rows of pillars** are fitted amidships the athwartship distance between the rows is to be about one-third the breadth of the vessel amidships; the **beams at the ends** which are less than two-thirds the length of the beam amidships, may be supported by one row of pillars, and be of the sizes required by columns 2, and where the lengths of the **beams at the ends** are less than half the midship beam length the sizes may be as required by columns **3** if supported by one row of pillars.

Where **three rows of pillars** are fitted amidships, the athwartship distances between the rows of pillars is to be about one-fourth the breadth of the vessel amidships, and the beams throughout are to be of the sizes required for beams amidships by columns **3**; but where the lengths of the **beams at the ends** are less than three-fourths the length of the beam amidships, two rows of pillars may be fitted; and where the **beams at the ends** are less than half the midship beam length, one row of pillars may be fitted.

6. If **beams of bulb angle section** are fitted at alternate frames in vessels exceeding 34 feet in breadth, a steel or iron deck should be fitted on these beams.

7. The **beams at the ends of hatchways** of 12 feet in length and above, where the through beams are fitted to every frame are to be equal in size to those required at alternate frames for their respective decks; where the through beams are fitted at alternate frames no increase in the size of the hatch end beams will be required.

All hatchways of 26 feet in length and above are to be supported at the corners by pillars or girders, in which case no increase is required in the size of the hatch end beams.

Single angles fitted to hatch end beams are to be equivalent to the double angles required by the Rules.

Half beams in way of hatchways or engine and boiler openings may be of the sizes required for beams with two rows of pillars, provided the half beams be efficiently pillared and attached to the coamings.

8. **Passenger decks.**—The beams of decks fitted exclusively for the accommodation of passengers may be of the size given for upper deck beams of the same length.

9. **"Strong" beams in the machinery space** of steamers are to have double angles on their upper and lower edges unless cross tie-plating is fitted on them, in which case only single angles need be fitted to the upper and lower edges of the beams.

10. **Beam knees and bracket knees.**—Where plate knees are not fitted, beam knees are to be efficiently welded.

The depth and thickness of welded knees, and the depth, breadth, and thickness of bracket knee plates (*see* **Sketches**, page 131) for beams fitted at every frame are to be as required by **Table 11**, and for beams to alternate frames as required by **Table 12** for the respective decks, except in the following cases where the beam knees are to be as required by **Tables 11** and **12** for upper deck beams of steamers having the same midship length of beam and having one tier of beams only :—

(*a*) The upper deck beam knees where the beams below are widely spaced.

(*b*) The beam knees at watertight flats for deep tanks.

(*c*) The lower and orlop deck beam knees of sailing vessels.

11. In the **upper deck of large vessels** having no decks below, the beams at every frame are to have plate bracket knees as follows :—

Where the depth (d) of the vessel is

23 ft. and under 24 ft. the knees are to be 33 × 33 × ·50 ins.
24 „ „ 25 „ „ „ „ 36 × 36 × ·52 „
25 „ „ 26 „ „ „ „ 39 × 39 × ·54 „
26 „ „ 27 „ „ „ „ 42 × 42 × ·54 „

The 42 in. bracket knees are to be stiffened by being flanged on the inner edge.

12. Beam knees are to measure across the throats not less than six-tenths of the depths required for the knees.

13. **Riveting of beam knees.**—Not more than two holes are to be punched in each beam knee before the beam is properly adjusted in its position.

14. The number and size of the rivets in the beam knees, or in both arms of bracket plate knees, are to be sufficient to ensure the riveted parts being efficiently closed, and in no case to be less than given in the following table :—

Depth of Knee.	Number of rivets.	Diameter of rivets.
Under 17 inches.	4	¾ of an inch.
17 and under 21 „	5	¾ „
21 „ „ 24 „	5	⅞ „
24 „ „ 28 „	6	⅞ „
28 „ „ 32 „	7	⅞ „
32 „ „ 36 „	8	⅞ „
36 „ „ 40 „	9	⅞ „

WIDELY SPACED BEAMS IN HOLD.

Section 21. 1. **A tier of beams in hold,** such that the depth (**d**) (**Section 2, paragraph 3**) may be taken between it and the top of floors to determine the scantlings of transverse framing, must have the beams of the size given for "strong" hold beams by **Table 12,** and having a rider plate of at least the breadth and thickness of the beam plate.

These beams are to be fitted not lower than the middle of the depth of the hold and are to be spaced not more than 24 feet apart. They are to have a **broad hold stringer plate** riveted to the beam ends. The breadth and thickness of the stringer plate is to be as given below, and it is to be attached to the outside plating with double angles $3\frac{1}{2}'' \times 3\frac{1}{2}''$, and of the thickness of the stringer plate.

A bulb angle, or equivalent channel, face bar of the size given below is to be riveted to the inner edge of the stringer, and the stringer is to be supported by brackets at alternate frames. *See* **Sketch** on page 123.

L × (B + D)	Depth from Top of Floors to Top of Beam of Lowest Laid Deck at Side.		
	Feet. Above and Not exceeding 21 23	Feet. Above and Not exceeding 23 25	Feet. Above and Not exceeding 25 27
Above and Not exceeding	Inches.	Inches.	Inches.
18200 „ 26400	60 × ·56	64 × ·58	68 × ·60
26400 „ 34800	64 × ·58	68 × ·60	72 × ·62
Bulb Face Angle	$11 \times 3\frac{1}{2} \times \cdot 58$	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$	$12 \times 4 \times \cdot 62$

2. Gusset plates, four frame spaces in length and of a breadth equal to one half their length, also of the thickness of the stringer plate, are to be fitted connecting the "strong" hold beams to the stringer plate; and brackets are to be fitted connecting the stringers to the bulkheads.

PILLARS.

Section 22. 1. **Pillars** are to be of malleable steel or iron of the sizes given in **Tables 14** and **15,** or they may be of other approved form of equal strength. The number of rows of pillars is to correspond with the requirements of **Tables 14** and **15,** and **Section 20, paragraph 5.** Where the length of the midship beam exceeds 44 feet, not less than two rows of pillars are to be fitted, and where the length exceeds 60 feet, three rows are to be fitted. Where beams are at every frame, pillars are to be fitted at alternate beams and attached to continuous fore and aft girders under the deck.

The **girders** are to be attached to each beam, and to the bulkheads against which they abut, by short angles. For widely spaced pillars and girders at heads of same, *see* **Tables 15** and **16,** and **Sketches** on pages 132 to 141.

2. **Riveting of pillars.**—Pillars to beams are to be arranged between decks and in the holds so as to form continuous ties from the floors to the weather deck beams. The heads of pillars are to be fitted close under the beams or girders, and the heels are also to be fitted close.

Where the lengths of pillars are under 18 feet, and the diameters are under 4 inches, the ends are to be attached by not less than two $\frac{7}{8}$ inch rivets. Where the lengths are 18 feet and under 24 feet, or the diameters are 4 inches and under 5 inches, there are to be not less than three rivets in each end of the pillars, and where the diameters of the pillars are 5 inches and over, not less than four rivets are to be fitted.

3. The heels of pillars at inner bottoms are to be fitted and riveted to short tee or angle bars.

4. **Deck openings.**—Where beams are fitted of the scantlings required with two or three complete rows of pillars, the row of pillars on each side is to be continued in way of all deck openings.

Where beams are fitted of the scantlings required with two rows of pillars, the pillars on each side in way of hatchways may be spaced four frame spaces apart provided they be increased $\frac{1}{2}$ an inch in diameter, and the lower edges of the coaming plates be flanged for a breadth of 6 inches.

5. **Pillars under widely spaced hold beams** may be of the sizes required for pillars of the same length under the deck next above the hold beams.

6. **Passenger decks.**—If the "second" deck is intended exclusively for the accommodation of passengers, the pillars between this deck and the floors may be $\frac{1}{4}$ inch less in diameter than required by the Tables; and where the deck next below is also intended for passengers exclusively, the pillars between this deck and the floors may be $\frac{1}{2}$ inch less than required by the Tables.

7. **Quarter pillars in deep tanks.**—A complete row of quarter pillars attached to an intercostal girder should be fitted on each side of the middle line bulkhead in deep tanks.

8. **Additional Pillaring.**—The pillars to the coamings of hatchways in vessels where only a centre row of pillars is fitted are not to exceed four frame spaces apart on each side, and hatchways 26 feet in length and above are to be

pillared at the corners in addition. Under deck houses, heel of bowsprit, windlass, steam winches and capstans, the beams are to be additionally pillared.

9. Where **double pillars** are fitted for the purpose of securing shifting boards, they are not to be less than three-fourths the diameter required for single pillars.

10. **Pillars on a shaft tunnel.**—If pillars be fitted on a shaft tunnel, the tunnel should be strengthened in way of them, by doubling plates, angle bars, and a transverse vertical plate, or by other efficient means.

11. Where a **middle line bulkhead** is fitted in lieu of a row of pillars, it is not to be less than $\frac{5}{16}$ of an inch in thickness if of iron, or ·30 of an inch if of steel, and connected at the bottom and to plating on the beams by single angles not less than $3\frac{1}{2}'' \times 3\frac{1}{2}'' \times ·40''$.

The vertical stiffeners are to be spaced not more than two frame spaces apart, and below the lowest laid deck they are to be of the size required by **Table 10** for transverse watertight bulkheads, where quarter pillars are fitted the size of these stiffeners may be modified subject to the approval of the Committee.

The stiffeners at the ends of hatchways are to be bracketed at top and bottom, and the remainder of the stiffeners are to be riveted to the beams and attached at the bottom by double riveted lugs.

In the 'tween decks the stiffeners are to be of double angles of the size required by **Table 10** for 'tween deck stiffeners on transverse watertight bulkheads, or of single angles of equivalent size. They are to be spaced not more than two frame spaces apart and riveted at their upper ends to the deck beams.

12. The **beams in the machinery space** are to be pillared where practicable. Quarter pillars to these beams may be dispensed with provided they are supported by straight bunker sides or casings not less than ·30 of an inch thick, having stiffeners extending from the lowest complete tier of beams to the inner bottom and spaced not more than two frame spaces apart. The stiffeners may be one inch less in depth than would be required for a middle line bulkhead. They are to be attached at their heels to the inner bottom by double riveted lugs and riveted at their heads to the beams and half-beams.

PLATING.

Section 23. 1. **Thickness.**—The thickness of the outside plating as given in **Tables 17** and **18**, for half the vessel's length amidships, is to be maintained for that length, and may thence be gradually reduced to the thickness given for the extreme ends.

In a steamer having a tonnage co-efficient of ·76, or having a full form at the fore part, the three strakes of outside plating next the keel are to have the midship thicknesses maintained forward to the collision bulkhead.

In single screw steamers the plates connected to the stern frame, and in twin screw steamers the plates connected to the "spectacle frame" and to the stern frame must be of the thickness required for the same strakes amidships. Plates on the "spectacle frame" of twin screw steamers, and on the boss of single screw steamers which are to be furnaced should be supplied of the thickness required for propeller boss plates in Table 17. The outside plating is to be of increased thickness or doubled in way of hawse pipes.

2. **Shift of butts.**—No butts of outside plating in adjoining strakes to be nearer each other than two spaces of frames; and the butts of the alternate strakes not to be under each other, but shifted not less than one frame space.

3. The butts of the upper, awning or shelter deck stringer plates are in all cases to be shifted not less than two frame spaces clear of the butts of the sheerstrakes.

4. The butts of the strakes next to the keel are to be shifted clear of the keel butts, or scarphs, and not to be nearer each other on opposite sides of the vessel than two frame spaces.

5. **Fitting and caulking of butts and edges.**—All flush butts of plating to be planed and fitted close; all overlapped butts and edges of the plating to be sheared from the faying surfaces, or the "burr" caused by shearing to be carefully chipped off, and all outside edges of seams and lapped butts of plating are to be either planed or chipped fair. The butts and edges to be carefully caulked.

6. The **sheerstrake** to extend sufficiently above the upper deck beam ends to take at least two rows of rivets vertically in the butts above the upper flange of the gunwale angle bar.

7. **Breadths of strakes.**—The maximum breadths of strakes of outside plating for which the butt riveting required by **Table 21** is applicable are to be as follows :—

Depth (D) of vessel.	Maximum breadth of strake of plating.
Feet.	Inches.
Not exceeding 20	54
Above 20 and " " 24	60
" 24 " " " 28	66
" 28	72

If it is proposed to use wider strakes of plating than the foregoing, the riveting of the butts is to be specially submitted.

8. Where it is proposed to cut **large openings** in the topside plating, efficient compensation is to be provided to the satisfaction of the Committee.

Bulwark Plating and Stanchions.

9. **Steamers.** — The stanchions which support the bulwarks in steamers are not to be more than 6 feet apart, and the stanchions nearest to the ends of a bridge or a long poop are not to be more than 5 feet from the bridge or poop bulkhead, and to be made additionally strong to the satisfaction of the Surveyors. The bulwark plating at these parts is to be increased in thickness and supported by bracket plates.

The continuity of strength is to be carefully ensured at the break of erections ; and gangways, doors, and other openings in the bulwark plating are to be kept well clear from these breaks. Freeing ports in bulwarks adjacent to the extremities of a bridge, or the front of a long poop, are to have rounded corners and substantial rims. When mooring pipes are fitted in bulwarks the plating in way of same must be doubled.

BUTT-STRAPS AND EDGE LAPS.

Section 24. 1. The breadth and thickness of butt-straps of outside plating, inner bottom plating, deck stringers, plating, floors, keelsons, &c., also the breadths of edge laps of the above, and the number of rows of rivets in such butt-straps and edge laps, together with the spacing of same, are to be as stated in **Tables 19, 20,** and **21.**

Lining Pieces.

2. The space between the plating and the frames to have solid filling or lining pieces of iron or steel in one length, closely fitted ; to be of the same breadth as the frames, excepting in way of bulkheads, where they are to be fitted as stated in **Section 19, paragraph 6.**

RIVETING AND RIVETS.

(See also Tables 19, 20, and 21.)

Section 25. 1. **Workmanship.**—The work is to be carefully closed with nut and screw bolts before the riveting is commenced. Unfair holes are to be properly rimed out and re-countersunk if necessary, and not to be cut with a chisel or unduly drifted. The rivets are to be properly staved up so as to completely fill the holes, their heads are to be "laid up" close, and the points or outer ends are to be left full and are not to be below the surface of the plating.

The Surveyors are to see that the rivet holes are properly formed, and the "burr" caused by punching must be removed before the parts are fitted together for riveting.

The rivet holes are to be regularly and equally spaced and carefully punched from the faying surfaces, opposite each other in the adjoining parts, laps, lining pieces, butt-straps and frames. The rivet holes in frames at the turn of the bilge are not to be punched until the frames are bent to the required shape ; the holes in way of the lands of the plating are to be drilled or "beared" after the frames are faired in place, and the plate edges lined off.

2. **Quality and Testing of Rivets.**—Rivets, whether of iron or steel, are to be of the best quality, and the Surveyors are to test samples of the rivets when delivered in the shipyards where they are to be used.

3. **Form of Rivet.**—The rivets are to be in diameter as required by **Tables 19** and **20,** and to be increased in size under their heads to fill the rivet holes. Those used for outside plating are to be of the form shown in **Table 20.**

4. **Countersinking.**—The countersinking of the rivet holes is to extend through the whole thickness of the plate or angle when the thickness is less than ·60 of an inch, and when the thickness is ·60 of an inch or above, the countersinking is to extend through nine-tenths the thickness of the plate. The size of the countersink is to be in accordance with the figured dimensions shown in **Table 20.**

5. **Arrangement of Rivets.**—The size and spacing of the rivets in the various parts of the structure are to be in accordance with the requirements of **Tables 19, 20,** and **21.** The butts of outside plating, and all double and treble riveting, except in the keel, stem and sternpost are to be chain riveted. The keel, stem and sternpost, the butts of outside plating, deck stringers and tie plates on beams, keelsons, stringers, and all longitudinal ties, are to be at least double riveted in all vessels. The butts of deck plating are to be at least double riveted for half the length amidships. The butts and edges of the plating of watertight bulkheads may be single riveted, except the seam connecting the bulkhead plating to floor plate, which must be double riveted.

6. **Number of Rows of Rivets in Seams of Outside Plating.**—The landing edges of outside plating when ·36 of an inch in thickness and above from the keel to the upper turn of bilge, and when ·48 of an inch and above from the upper turn of bilge to the gunwale, must be at least double riveted; below these thicknesses the edges may be single riveted.

Where the side plating is ·84 inch and above in thickness, the seams of the same are to be treble riveted for four-fifths the vessel's length amidships. The edges of the sheerstrakes are to be double riveted in all cases; except where the side plating is ·84 of an inch and above in thickness, when they are to be treble riveted.

The thicker of the two plates is to regulate the size of the rivets and the requirements as to double riveting. When the plating is of a thickness amidships to require the edges to be double riveted, the same is to be continued all fore and aft.

In vessels of 480 feet in length and upwards, with side plating less than ·84 inch in thickness, the landing edges are to be treble riveted for one-fourth of the vessel's length in the fore and after bodies for a depth of one-third the depth of the vessel, the actual position of this treble riveting to depend upon the arrangement of shell plating and the special design of the vessel; or other equivalent strengthening to be afforded.

Vessels of from 450 feet to 480 feet in length are to be additionally riveted at the before mentioned parts proportionately to their length, or to have other equivalent strengthening. Each case requiring this additional riveting of the seams is to be submitted for the approval of the Committee.

7. **Spacing of Rows of Rivets.**—The breadth of butt straps, butt laps and edge laps are to be in accordance with the requirements of **Tables 19** and **21**. The rivets are not to be nearer the butts or edges of the plating, butt straps, butt laps, or of any angle bar than a space equal to their own diameter.

In edge riveting the space between any two consecutive rows of rivets must not be less than once and a half their diameter.

In butt straps the space between any two rows must not be less than twice the diameter of the rivets, and in butt laps the space between consecutive rows is not to be less than two and a half times the diameter of the rivets.

8. **Doubling Plates.**—When plates have to be doubled the butts of these plates and of the doubling plates are to have the butt straps double or treble riveted, as may be required by **Table 21**, and in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames, in addition to the rivets which pass through the frames, and the middle of the plates are to be riveted up before the edges.

DECKS.

Wood Decks.

Section 26. 1. The flat of decks, if of wood, to be of good quality, properly seasoned, free from sap and objectionable knots; the thickness to be as follows:—

Longitudinal Number L × (B + D).	At Upper Decks.		At Awning or Shelter Decks, and at Decks of Erections.	
	Thickness.		Thickness.	
	Pine.	Teak.	Pine.	Teak.
	inches.	inches.	inches.	inches.
1200 and under 2400	$2\frac{1}{2}$	—	2	—
2400 „ 3700	$2\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$	—
3700 „ 5200	3	$2\frac{1}{2}$	$2\frac{1}{4}$	—
5200 „ 7000	$3\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{1}{2}$	2
7000 „ 8800	$3\frac{1}{2}$	3	$2\frac{3}{4}$	$2\frac{1}{4}$
8800 „ 11800	$3\frac{3}{4}$	3	$2\frac{3}{4}$	$2\frac{1}{4}$
11800 „ 82000	4	$3\frac{1}{4}$	3	$2\frac{1}{2}$

The thickness of a wood deck below an upper deck need not exceed $3\frac{1}{2}$ inches.

2. **Pitch Pine and Yellow Pine.**—Pine planks for weather decks should not be laid within a period of from four to six months (according to their thickness) after being cut; and where pitch pine is used for weather decks the breadth of the planks should not exceed 5 inches, and the period of seasoning should not be less than six months.

3. **Oregon Pine.**—Oregon pine of good quality will be admitted for decks of vessels, provided it be laid with the grain vertical, and the width of planks and period of seasoning be as required for pitch pine.

4. **Artificial Seasoning.**—The above required periods of seasoning will not be necessary in cases where satisfactory artificial means of seasoning are adopted.

5. The Surveyors must ascertain that the requirement as to the seasoning has been complied with.

6. The deck is to be laid and caulked to the satisfaction of the Surveyors.

7. When **gutter waterways** are adopted at the upper deck, the angle bar forming the inner edge of waterways is not to be less in thickness than

·50	where the thickness of the deck is	4 inches.
·44	" " " "	$3\frac{1}{2}$ inches.
·40	" " " "	3 inches.

8. **Margin Planks.**—In all cases the margin planks of weather decks are to be either of Teak or Greenheart.

9. **Fastenings.**—When the deck planks are 6 inches in width or under, single fastening will be sufficient; but when they are above 6 inches and not exceeding 8 inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding 8 inches in width must be double fastened with nut and screw bolts.

10. The upper deck to be fastened by galvanised screw bolts with nuts at the under side of the angle bar of the beams and tie-plates. The bolts must be properly sunk, with oakum and white lead under their heads, and be carefully covered over with turned dowels bedded in white lead, marine glue, or other suitable composition.

Pine decks from 2 inches to $3\frac{1}{4}$ inches in thickness are to be fastened with bolts $\frac{1}{2}$ inch in diameter, and where the decks are from $3\frac{1}{2}$ inches to 4 inches in thickness, by bolts $\frac{5}{8}$ inch in diameter. Teak decks from 2 inches to $2\frac{3}{4}$ inches in thickness are to be fastened with bolts $\frac{1}{2}$ inch in diameter, and where the decks are from 3 inches to $3\frac{1}{4}$ inches in thickness, by bolts $\frac{5}{8}$ inch in diameter.

11. **Pads not to be used.**—Where diagonal plates are fitted on the beams, the deck planks are to be scored over the diagonal plates, so as to fit closely on the beams, thereby avoiding the use of wood pads.

Steel Decks.

12. **Steel decks** are to be fitted as required by **Tables 17** and **18** of the Rules.

13. Where the **beams at unsheathed iron or steel decks** required by the Rules are not fitted at every frame (*see* Sec. 20, par. 4), the thickness of the plating is not to be less than required by the following Table :—

Spacing of beams in inches	...	42 to 44	46 to 54
Thickness of plating amidships in inches — Steel	...	·36	·40
Thickness of plating amidships in inches — Iron	...	$\frac{6}{16}$	$\frac{7}{16}$

14. **Continuity of Strength.**—Where a steel or iron deck is required by the Rules care should be taken to preserve the continuity of strength at all parts where local stiffness is unavoidably introduced. If intercostal girders are not adopted for the purpose of supporting the beams such girders are to be fitted to prevent local straining between the coamings of hatchways, engine and boiler room openings, deck houses, &c., at the amidship portion of steel or iron bridge, awning or shelter, and upper decks as well as of the deck next below an awning or shelter deck. They should be efficiently connected to the various coamings and casings by laps or brackets, or if not in line with these they should be made to scarph them by a sufficient distance.

15. **Steel Decks for one-half length.**—Where a steel deck is prescribed in **Table 18** to be fitted for one-half the vessel's length amidships, it is to be maintained the full breadth of the vessel for that length and then tapered gradually into the stringer plates for one-eighth the vessel's length at each end.

16. **Wood Sheathing.**—If a wood flat be laid over an iron or steel upper, awning or shelter deck, the thickness should not be less than 3 inches if of pine and $2\frac{1}{2}$ inches if of teak, and it should be efficiently secured between the beams to the deck plating. Steel or iron decks are not to be reduced in thickness from that given by **Tables 17** and **18**, when sheathed with wood.

The thickness of a wood flat laid over a steel or iron deck below an upper, awning or shelter deck need not exceed $2\frac{1}{2}$ inches.

17. **Caulking.**—All decks of steel or iron are to be caulked, unless sheathed with a properly caulked wooden deck.

18. **Deck openings.**—Where large openings are cut in deck plating, compensation is to be given for the same.

Where steel or iron decks are fitted as required by the Rules the thickness of the plating must be increased so as to efficiently maintain the strength of the deck in way of all hatchways and engine and boiler openings, and, in addition, doubling plates are to be fitted at the corners of all large deck openings, or the deck plating increased in thickness equivalent to the doubling plate.

19. **Iron decks** will be admitted in lieu of steel decks, provided the thickness of the plating be ten per cent. in excess of the thickness required by **Tables 17** and **18** for steel decks.

20. **Water Testing.**—All upper and weather decks of new vessels, of whatever material they are constructed, are, when complete, to have their watertightness tested by a hose in the presence of the Surveyors, who are to state in their First Entry Report the results of such tests.

All gutterways of new vessels are to be tested by being flooded with water, where possible, to ensure watertightness, and the Surveyors are to state in their First Entry Report the results of such tests.

STRINGERS ON BEAMS.

Section 27. 1. **Stringer plates** are to be fitted upon the ends of each tier of beams. Those upon the ends of the upper, awning or shelter deck beams to be of the breadth and thickness given in **Table 18,** and those upon the ends of deck beams below upper, awning or shelter decks to be as given in **Table 17.** Deck stringer plates are to maintain their midship breadth and thickness for one-half the vessel's length amidships; from thence the breadth and thickness may be gradually reduced to those given in **Tables 17** and **18** for the ends of the vessel. In way of a long bridge the upper deck stringer plates may be reduced in thickness as shown by **Table 18.** The stringer plates on widely spaced beams in hold to be as given in **Section 21.**

2. The stringer plates on all deck beams are to be fitted home and riveted to the outside plating, all fore and aft, with angle bars of the dimensions required by **Tables 17** and **18.** The stringer plates of all decks below the upper, awning or shelter decks are to have an additional angle bar of the same dimensions fitted inside the reversed frames and extending all fore and aft. For stringer angles on widely spaced hold beams see **Section 21.**

3. When the frames are extended through the upper deck stringer plate to form frames for bridges, poops and forecastles, there must be a continuous angle bar, of the size given in **Table 17,** wrought on the upper deck stringer plate inside the frames.

4. The upper deck stringer angle bar is in all cases to be fitted on the upper side of the stringer plate.

5. When gutter waterways are fitted to upper decks in vessels having poops or forecastles, the angle bars forming the ends of the gutters are to be welded, and the gutters to be carefully caulked.

TIE-PLATES ON BEAMS.

Section 28. 1. Where there are no steel decks laid, **tie-plates** are to be fitted on the beams, extending all fore and aft upon each side of the hatchways. Upon deck beams below the upper deck, on which no deck is laid, double angle bars of the sizes given in **Table 17** for beam stringer angles, placed at middle line or at each side of the hatchways, will be admitted in lieu of plate ties.

2. The tie-plates are to be of the width and thickness given in **Tables 17** and **18,** for half the vessel's length amidships, tapered at the ends to the same thickness as the ends of the stringer plates. They are to be well riveted to each other and to the beams and stringers.

HOOKS AND CRUTCHES AND PANTING ARRANGEMENTS.

Section 29. 1. **Spacing of stringers at ends.**—Stringers, where practicable, are to extend all fore and aft, and to be efficiently connected at their ends with plates forming hooks and crutches of the same thickness as the floor-plates amidships, and those below the hold beams are to be spaced about 4 feet apart. In vessels whose longitudinal number is 18,200, or above, an additional hook or crutch should be fitted at the ends of the vessel, between each tier of beams, to the satisfaction of the Surveyors.

2. **Beams in peaks.**—Tiers of beams are to be fitted throughout the depth of peaks, the tiers being spaced not more than 8 feet apart.

3. All vessels to have, in addition, provision made to prevent panting, by means of an extra tier or tiers of beams, also by bracket knees, and stringer plates, fitted abaft the collision bulkhead.

4. Where a vessel has considerable sheer, additional transverse strength in the form of beams or otherwise is to be provided, having regard to the form of the vessel.

5. Panting beams and stringers are to be fitted at the after end of vessel where considered necessary by the Surveyors. Sketches of panting arrangements are in all cases to be submitted for approval. The stringer plates on panting beams are to be worked intercostally between the beams, and attached to the outside plating.

ENGINE AND BOILER SPACE.

Section 30. 1. **Engine and Boiler bearers.**—In steam vessels care must be taken that the engine and boiler bearers are properly constructed, and fitted with efficient longitudinal ties. Where the bearers interfere with the longitudinal strength of the vessel, they must extend a sufficient distance beyond the bulkheads of the engine and boiler space to compensate for the same.

When engines of high power are fitted.—Where it is intended to fit engines of greater power than in ordinary cargo carrying steamers, the engine seating is to be of proportionately greater strength, and to be specially adapted with this object in view by being connected to the sides of the vessel. Other means are, if necessary, to be adopted in order to ensure the rigidity and strength necessary to withstand the vibration produced in this part of the vessel.

2. **Strengthening in machinery space.**—Additional strengthening by means of web frames, and "strong" beams, or otherwise is to be provided in the machinery space. Plans showing the proposed additional strengthening are to be submitted for approval.

3. **Clearance between bulkheads and boilers.**—Coal bunker bulkheads are to be kept well clear of the boilers and their uptakes. Where the boiler room bulkhead is recessed for a donkey boiler, the recess is to be of a size sufficient to give space all round the boiler to admit of its being properly attended to.

In order to afford protection against the heat from the boiler, the roof of the recess is to be not less than 4 feet clear of the top of the boiler, the space between the bunker or hold bulkhead plating and the chimney is to be not less than 18 inches, and a baffle plate is to be fixed between the chimney and the bulkhead; other efficient means may be provided. Wood lining is to be fitted on the hold side of the recess plating with an air space between it and the plating.

4. **Tie-beams across recess.**—When a recess extending above the hold beams is formed in the engine room bulkheads, the bulkhead is to be efficiently connected from side to side by a tie or bridle beam at about the height of the hold beams, strongly riveted to the plating and fitted with efficient gusset plates.

5. **Protection of deck under donkey boilers.**—Where vertical donkey boilers are placed on the decks of vessels, the deck underneath them is to be protected by being covered with firebrick or cement not less than 2 inches in thickness. The deck on which fires may be drawn from any donkey boiler is also to be protected by firebrick or cement not less than 2 inches in thickness.

6. **Shaft tunnel.**—The plating of shaft tunnels is to be of the thickness required in **Table 10** for the lower part of bulkhead plating; the top plating in way of the hatchways to be not less than ·10 of an inch thicker than the remaining plates, or to be covered with wood not less than 2 inches thick.

The tunnel is to be strengthened with transverse angle bars of the size of the lower deck stringer angles spaced not more than two frame spaces apart, and 3 feet in way of the hatchways.

The plating is to be caulked, and the tunnel tested with water from a hose to ensure its being watertight.

The bulkheads and top plating of tunnel recesses to be strengthened and supported by similar angles, but spaced the same as the vessel's frames; the top plating where attached to the sides of the vessel to be made watertight with steel or iron collars or chocks, to the exclusion of wood or cement.

The tunnel to be fitted with a watertight sluice door on the engine-room bulkhead, capable of being closed from the upper deck.

If a pipe tunnel is led through the forward holds, its structure is to be the same as that of a shaft tunnel.

ENGINE AND BOILER OPENINGS.

Section 31. 1. **Framing of openings.—The engine and boiler openings** of the weather deck of steam vessels are to be properly framed for a height of not less than 18 inches above the deck, the coaming plates to extend to the lower edge of the beams, and iron or steel casings connected to the coamings should be fitted to a height of about 7 feet above the deck.

In awning or shelter, and part awning deck vessels the height of the casing need not exceed 4 feet 6 inches above the deck, provided suitable iron covers be fitted, and

the openings have coamings on the top of the casings not less than 9 inches in height.

The thickness of the casings, where exposed, to be not less than that required for the side plating of poops, and to be efficiently stiffened by vertical angles spaced 30 inches apart, connected to the coaming plates. The thickness of the coamings to be ·06 of an inch more than required for the casings.

Where the casings are enclosed by a bridge, and efficiently protected from the force of the sea, a reduction from the above thickness might be admitted, provided in such cases a plan showing the proposed arrangement be furnished for approval.

2. **Trunk casings.**—The engine and boiler openings in the 'tween decks of all vessels are also to be enclosed by trunk casings efficiently stiffened by angle bars 30 inches apart, and extending to the weather deck beams, to which they are to be secured.

3. **Strong iron doors** will be allowed in these trunk casings, provided their lower parts are at least 18 inches above the deck, and efficient arrangements made for their security.

4. **Height of coamings.**—When a poop, or bridge, covers the engine and boiler space, the coaming of the engine and boiler openings should not be less than 2 feet above such deck, unless these openings are constructed as provided for in the first paragraph of this Section.

5. The **engine and boiler openings** should be made as **small as practicable,** and be subdivided by athwartship iron divisional bulkheads. The two sides of the casing should in all instances be efficiently connected by angle beams within them at the upper part.

6. **Skylights and gratings.**—The engine-room skylights are to be substantially constructed, and to be securely bolted or riveted to the coamings, and where the skylight top is not solid, with bull's eyes fitted in the same, efficient deadlights must be provided. The grating openings over the stokehold must also be protected by plates, fitted with hinges, or otherwise in a manner satisfactory to the Surveyors.

7. **Plating in way of openings.**—Where either of the openings exceeds 15 feet, or the combined length exceeds 30 feet, the beams in way of the same are to be plated over from the stringer to the tie-plates, the plating extending two beam spaces beyond the openings, and tapered from thence towards the stringer plate for a distance not less than the breadth of the plating required to be fitted.

8. Where **large openings** are adjacent to each other, the intervening space between the openings is to be plated over.

9. **Steam Trawlers.**—In all steam trawlers the deck beams should be wholly plated over in way of the engine and boiler casings, and the casings should extend down to the underside of the deck beams, and be connected to the deck plating with angle bars and to the half beam ends with angle lugs. If the casings be not extended down to the underside of the beams, they should be attached to the deck plating with angles $4\frac{1}{2}'' \times 4\frac{1}{2}'' \times {\cdot}36,''$ having two rows of rivets in each flange. In order to ensure that the scantlings and construction of these casings are satisfactory in every case, detailed plans of the same should be submitted for approval.

HATCHWAYS.

(See also Sketches, pages 142 & 143.)

Section 32. 1. **Hatchway Beams.**—Beams at the ends of hatchways may be fitted with a large single angle bar, on the side of the beams clear of the hatchway, of equivalent sectional area to the double angles required by **Table 13.** Half beams are to be fitted to alternate frames in way of the hatchways where a wood deck is fitted, and to every frame under a steel or iron deck, unless a wood flat is laid thereon, in which case half beams may be fitted to alternate frames.

2. **Depth of Coamings.**—**The side coamings** are to extend to the lower edges of the beams at the ends of the hatchways. **The end coaming** plates are to extend to the lower part of the beams at the ends of the hatchways, and be riveted to them.

3. **Thickness of Coamings.**—The thickness of coamings to be as follows :—

Length of hatchways.	Side coamings.	End coamings.
Feet.	Inches.	Inches.
Not exceeding 12	·36	·36
Above 12 and " " 16	·40	·36
" 16 " " " 24	·44	·40
" 24 " " " 26	·46	·40
" 26 " " " 28	·48	·40
" 28 " " " 30	·50	·40

4. **Height of Coamings above Deck.**—The minimum heights of hatchway coamings above weather decks to be as follows, unless otherwise submitted and approved :—

On awning or shelter decks, and bridge decks	18 inches.
On upper decks (except under awning, shelter decks, or long bridges), and raised quarter decks	24 „
On upper decks in wells of well deck steamers, and under tonnage openings of shelter decks	30 „

5. **Shallow Coamings.**—Shallow coamings to hatchways below the weather deck will be sanctioned, provided the total depth of the fore and aft carlings and coamings be not less than 16 inches in hatchways of 10 feet and not exceeding 14 feet in length, 18 inches in hatchways of above 14 feet and not exceeding 18 feet in length, and 20 inches in hatchways of above 18 feet and not exceeding 24 feet in length ; but in all cases the coamings are to extend at least to the lower part of the beams at the ends of the hatchways. Hatchway side coamings below upper deck to be ·04 of an inch thicker than side coamings to upper deck hatchways of the same length.

6. **Where square corners are adopted,** the angles connecting the side and end coaming plates are not to be of less thickness than the side coaming plates.

7. **Connection of Coamings to Deck.**—The coaming plates are to be connected to the deck plating or tie plates with angles of not less thickness than the side coaming plates, welded at the corners of the hatchways. Where a wood deck is fitted, the vertical flanges of the angle bars connecting the side and end coamings to the deck are to extend half an inch above the deck.

8. **Material.**—All hatchway coamings on weather decks and the companions at the fore-end of steamers to be of steel or iron.

9. **Half Beams.**—Where half beams are fitted to alternate frames, they are to be connected to the coaming plates with double angles, and half beams fitted to every frame may be connected to coaming plates, with single angles of not less thickness than the side coamings. There are to be three rivets in each flange of the angles connecting coamings to the half beams where the depth of the half beam is $7\frac{1}{2}$ inches to $9\frac{1}{2}$ inches, and four rivets where the depth is 10 inches to 12 inches.

10. **Where there are no steel or iron decks,** plates are to be fitted and riveted to the hatchway beams in order that the ends of the wood deck may be properly fastened, and side coaming plates are to be connected to deck plates of the thickness required for tie plates. The fore and aft tie plates in way of hatchways 16 feet and under 22 feet in length are to be double the width of those given in **Tables 17** and **18** for a length extending two spaces of beams beyond each end of the hatchway.

11. **Plating in Way of Long Hatchways.**—Where the length of hatchway is 22 feet and above, the beams to upper deck (and deck above if fitted) are to be plated in way of same, and the plating is to be tapered before and abaft to stringer plate.

Where steel or iron decks are fitted in accordance with the Rules, the thickness of the plating must be increased so as to efficiently maintain the strength of the deck in way of all hatchways and engine and boiler openings, and, in addition, doubling plates are to be fitted at the corners of all large deck openings, or the deck plating increased in thickness equivalent to the doubling plate.

12. **Web Plates and Shifting Beams.**—Hatchways of above 10 feet and not exceeding 16 feet in length are to have shifting beams formed of plate and four angles, $3'' \times 3'' \times {\cdot}40''$. If the hatchways are not more than 12 feet in width, the shifting beam is to be $12'' \times {\cdot}40''$ and if above 12 feet and not exceeding 16 feet in width $15'' \times {\cdot}40''$.

When the length of a hatchway is from 16 feet to 20 feet, a web plate beam is to be fitted at the middle of the length, extending in depth to the lower edges of the coamings. If the length is above 20 feet and not exceeding 30 feet, two web plate beams are to be fitted.

Efficient means are to be provided for securing the shifting beams and web plates to the coamings.

The web plate beams are to be stiffened at the upper and lower parts with double angles, and the thickness of the web plate is to be the same as that of the end coamings. Web plate beams in hatchways below the weather deck where shallow coamings are fitted are to be of not less thickness than the coamings to which they are attached, and to extend to the lower edge of the coamings.

Where shallow coamings are fitted, as described in **paragraph 5** of this Section, the depth of the web plate at middle is to be not less than one and a quarter times the depth at ends, and the upper and lower parts of the web plate are to be stiffened with double angles.

13. **Fore and Afters.**—Fore and afters are to be fitted in hatchways as follows :—

STEEL BULB PLATES.

Breadth of Hatchway.	Number of Fore and Afters.	Distance between Web Beams, Centre to Centre, in Feet.									
		5 and under 6		6 and under 7		7 and under 8		8 and under 9		9 and under 10	
		Centre.	Side.	Centre.	Side.	Centre.	Side.	Centre.	Side.	Centre.	Side.
Feet.		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
6 and under 8	1	8 × ·40	—	9 × ·40	—	10 × ·44	—	10 × ·50	—	11 × ·50	—
8 „ 10	1	9 × ·40	—	9 × ·44	—	10 × ·50	—	11 × ·50	—	11 × ·54	—
10 „ 12	3	8 × ·34	5 × ·24	8 × ·40	5 × ·24	9 × ·40	6 × ·24	9 × ·44	6 × ·30	10 × ·44	7 × ·30
12 „ 14	3	8 × ·40	5 × ·24	9 × ·40	6 × ·24	9 × ·44	6 × ·30	10 × ·44	7 × ·30	10 × ·50	7 × ·34
14 „ 16	3	9 × ·44	6 × ·30	10 × ·44	7 × ·30	10 × ·50	7 × ·34	11 × ·50	8 × ·34	11 × ·54	8 × ·40
16 „ 18	3	10 × ·44	7 × ·30	10 × ·50	7 × ·34	11 × ·50	8 × ·34	11 × ·54	8 × ·40	11 × ·60	8 × ·44
18 „ 20	5	8 × ·40	5 × ·24	9 × ·40	6 × ·24	9 × ·44	6 × ·30	10 × ·44	7 × ·30	10 × ·50	7 × ·34

WOOD.

Breadth of Hatchway.	Number of Fore and Afters.	Distance between Web Beams, Centre to Centre, in Feet.																			
		5 and under 6				6 and under 7				7 and under 8				8 and under 9				9 and under 10			
		Centre.		Side.		Centre.		Side.		Centre.		Side.		Centre.		Side.		Centre.		Side.	
		Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.	Depth below Hatches.	Breadth.
Feet.		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
6 and under 8	1	6	6	—	—	7	6	—	—	7½	7	—	—	8	7	—	—	9	7	—	—
8 „ 10	1	7	6	—	—	7	7	—	—	8	7	—	—	9	7	—	—	9	8	—	—
10 „ 12	3	5½	6	5	5	6	6	5	5	7	6	5½	5	7	7	6	5	7½	7	6½	5½
12 „ 14	3	6	6	5	5	7	6	5½	5	7	7	6	5	7½	7	6½	5½	8	7	7	6
14 „ 16	3	7	7	6	5	7½	7	6½	5½	8	7	7	6	9	7	7½	6½	9	8	8	7
16 „ 18	3	7½	7	6½	5½	8	7	7	6	9	7	7½	6½	9	8	8	7	9½	8	8½	7½
18 „ 20	5	6	6	5	5	7	6	5½	5	7	7	6	5	7½	7	6½	5½	8	7	7	6

The angles on the centre fore and afters are not to be less than $3'' \times 2\frac{1}{2}'' \times {\cdot}30$ inch where the depth of the bulb plate is less than 9 inches, and not less than $3'' \times 3'' \times {\cdot}36$ inch where the depth is 9 inches and above. The double angles on the side fore and afters are not to be less than $2\frac{1}{2}'' \times 2\frac{1}{2}'' \times {\cdot}30$ inch. The wood fore and afters are to be of pitch pine, or other wood of not less hardness and strength, free from shakes or other defects; and the centre fore and afters are to be cut from the solid wood. When wood fore and afters are used iron plates are to be fitted to their ends. All fore and afters to be efficiently supported at the end coamings and web plate beams with

castings or angles having a bearing of not less than 2 inches; and fore and afters, whether of steel or wood, should also be supported by the shifting beams when such are fitted in the hatchway.

14. **Hatch covers when fore and afters are fitted.**—The hatches of all vessels to be solid (or gratings of sufficient strength) and not less than $2\frac{1}{2}$ inches thick in hatchways not exceeding 16 feet in breadth; where this breadth of hatchway is exceeded the hatches are not to be less than 3 inches in thickness, where fore and afters are fitted as described in **paragraph 13.** Efficient supports are to be provided, having at least $1\frac{3}{4}$ inches bearing, for the ends of the hatches.

15. **Where fore and afters are dispensed with,** deep transverse web plates are to be fitted in the hatchways as given in the following table :—

WEB PLATE BEAMS WITHOUT FORE AND AFTERS.

Breadth of Hatchway.	Spacing of Web Plates 4 feet and under 4 feet 6 inches. Minimum depth below Hatches, and thickness. Centre.	Ends.	Double Angles on Upper and Lower Parts.	Spacing of Web Plates 4 feet 6 inches and under 5 feet. Minimum depth below Hatches, and thickness. Centre.	Ends.	Double Angles on Upper and Lower Parts.
UPPER AND ALL WEATHER DECK HATCHWAYS.						
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12 and under 14	14 × ·34	11 × ·34	3 × 3 × ·40	16 × ·34	12 × ·34	3 × 3 × ·40
14 „ 16	16 × ·34	13 × ·34	3 × 3 × ·40	19 × ·34	14 × ·34	3 × 3 × ·40
16 „ 18	18 × ·34	14 × ·34	† 4 × 3 × ·40	21 × ·34	16 × ·34	† 4 × 3 × ·40
18 „ 20	20 × ·40	16 × ·40	† 4 × 3 × ·40	23 × ·40	18 × ·40	† 4 × 3 × ·40
HATCHWAYS BELOW THE UPPER DECK.						
12 and under 14	13 × ·40	13 × ·40	3 × 3 × ·40	15 × ·40	13 × ·40	3 × 3 × ·40
14 „ 16	15 × ·40	13 × ·40	3 × 3 × ·40	17 × ·40	14 × ·40	3 × 3 × ·40
16 „ 18	16 × ·40	14 × ·40	† 4 × 3 × ·40	18 × ·40	15 × ·40	† 4 × 3 × ·40
18 „ 20	18 × ·44	15 × ·44	† 4 × 3 × ·40	20 × ·44	16 × ·44	† 4 × 3 × ·40

† 4 inch flange fitted horizontally.

The web plates are to be of the depth and thickness given in preceding Table, and are to be stiffened at the upper and lower parts by double angles, and alternate web plates are to be extended to the top of the wood hatches. If necessary, the web plates are to be increased in depth at the ends or are to have bracket plates fitted so as to extend to the lower edge of the coaming plates. The web plates are to be securely attached to the coamings by double angles $3\frac{1}{2} \times 3$ inches and of not less thickness than the web plates, or other efficient arrangements for securing the same are to be provided.

Hatch covers when no fore and afters are fitted.—Where this arrangement of web plates is adopted the hatches are to be solid (or gratings of sufficient strength) and not less than 3 inches in thickness, and efficient supports are to be provided, having not less than 3 inches bearing, for the ends of the hatches at the end coamings.

16. **Additional requirements for large hatchways.**—Plans of hatchways more than 30 feet in length or 20 feet in breadth, showing the scantlings and arrangements of deck plating, beams at ends of hatchways, coamings and web

plate beams are to be submitted for approval, together with the additional transverse strengthening proposed in way of the same, either by means of web frames, increased depth of framing, or by double reversed frames.

17. **Cleats** not more than 2 feet apart from centre to centre are to be fitted to the coamings for the purpose of efficiently securing the tarpaulin covers. The cleats to be of strong section. Flat iron bars and suitable wedges or other efficient means to be provided for securing the tarpaulins.

18. **Wing boards.**—In vessels having self-trimming hatchways, wing boards are to be fitted for preventing the shifting of cargo.

COAL BUNKER PIPES AND LIDS.

Section 33. Coal bunker pipes, where practicable, are to be formed so as to be at least 12 inches above the upper deck, fitted with lids having studs to fit in openings made in the pipes, for their security; the pipes to be so formed that a tarpaulin may be securely lashed over them. Where there are coal bunker hatches in the weather deck they must be properly framed with coaming plates of suitable height having solid hatches secured by an iron bar or other approved fastening.

MASTHOLES.

Section 34. In way of mast wedging, where iron or steel decks are not fitted, plates are to be riveted to the beams of not less thickness than is required for stringer plates amidships, and of not less width than three times the diameter of the mast. In steamers the mast ring is to be of plain angle of not less size than the bulb angle frames required in peaks.

VENTILATORS.

Section 35. 1. **Number and Size.**—It is recommended that ventilators, sufficient in number and size, be efficiently fitted to upper decks of all vessels.

2. **Ventilator Coamings.**—The coamings of weather deck ventilators should not be less than 3 feet in height and of the following thicknesses:—

Under 12 inches in diameter	...	$\frac{1}{4}$ of an inch.
12 inches and under 15 inches	...	$\frac{5}{16}$,,
15 ,, ,, 24 ,,	...	$\frac{3}{8}$,,

Where a steel or iron deck is fitted, these coamings are to be connected to it with angles $\frac{1}{16}$ of an inch thicker than the coaming. Where there is no steel or iron deck fitted, plates are to be fitted under the wood deck to take the bolt fastenings.

3. **Covers.**—Means are to be provided for efficiently closing the openings when the cowls are unshipped.

When scuttles are fitted for ventilation in the topsides of vessels, strong covers for them are to be provided; these covers to be efficiently fitted, to the approval of the Surveyors.

4. **Compensation for cutting side scuttles.**—Where scuttles are fitted in the sheerstrake within three-fifths of the vessel's length amidships, compensation is to be given either by an extra thickness in the sheerstrake, doubling plate in way of the scuttles, or else by the introduction of strong angle bars over them.

PORTS AND SCUPPERS.

Section 36. 1. All vessels must be fitted with a sufficient number of **freeing ports** and **scuppers**, to readily discharge any large quantity of water from the upper deck. The ports and flaps, where such are adopted, are to be hung by strong hinges with yellow metal pins, and the scuppers formed in the vertical flange of the upper deck stringer angle bar, which is to be increased in depth so as to enclose the scuppers; or any other equally efficient plan may be adopted.

2. Where the bulwark plating and main rail are cut through to form a gangway or cargo port, the **bulwark stays** at each end of the port should be of increased strength, to the satisfaction of the Surveyors.

3. A sufficient **number of scuppers**, with proper pipes attached to them, are to be fitted in all 'tween decks below upper deck to convey water or leakage to the bilges.

4. In "Well deck" vessels, the **freeing port area** in the "Well" should be in accordance with the following Table:—

Length of Bulwarks in "Well," in feet.		Freeing Port Area on each side, in square feet.
30	... ...	9·5
35	... ...	10·0
40	... ...	10·5
45	... ...	11·0
50	... ...	11·5
55	... ...	12·0
60	... ...	12·5

65 and above, one square foot to each 5-ft. length of bulwarks.

WINDLASS AND HAWSE-PIPES.

Section 37. 1. The **windlass** is to be of suitable size for the cable, and to be efficiently secured.

2. The **hawse-pipes** must be of sufficient size and thickness, and the outside flange of proper form to admit of an easy lead for the cable to the windlass or capstan.

CHAIN PLATES.

Section 38. The **chain plates** to be in proportion to the size of the vessel, and riveted efficiently to the outside plating (not bulwark plating), the sheerstrake being preferable.

PUMPING ARRANGEMENTS.

Section 39. 1. In steam vessels the pumping arrangements according to the division of holds, &c., are to be as follows:—

2. **Holds with double bottoms.**—In the double bottom of each compartment of the holds and of the engine and boiler space, a steam pump suction is to be fitted at the middle line, and one on each side to clear the tanks of water when the vessel has a heavy list.

Where there is considerable rise of floor towards the ends of vessels, the middle line suction only will be required. A steam pump suction and a hand pump are also to be fitted to each bilge in each hold where there is no well.

Where there is a well, one or three steam pump suctions are to be fitted in the same according as there is considerable or little rise of floor, and hand pumps are to be fitted at the bilges.

3. **Holds without double bottoms.**—Where there is considerable rise of floor, one steam pump suction and one hand pump are to be fitted in each hold. Where there is little rise of floor, two or three steam pump suctions and at least one hand pump are to be fitted to each hold.

4. **Engine and boiler space.**—Where a double bottom extends the whole length of the engine and boiler space, two steam pump suctions are to be fitted to the bilge on each side. Where there is a well, one steam pump suction should be fitted in each bilge and one in the well. Where there is no double bottom in the machinery space, centre and wing steam pump suctions should be fitted.

The rose box, or strum, of the bilge injection is to be fitted where easily accessible. The main engine bilge pump and the donkey pump are to be arranged to draw from all compartments, and the donkey pump is to have also a separate bilge suction in the engine room, which can be used at the same time as the main engine bilge pumps are drawing from any other part of the vessel.

5. **Fore and After Peaks.**—If the peaks are fitted as water ballast tanks, a separate steam pump suction is to be led to each. If not used for water ballast, an efficient pump is to be fitted in the fore peak. If the after peak is used as a ballast tank, no sluice valve or cock is to be fitted to the after bulkhead; but if it is not so used, and if no pump is fitted in it, a sluice valve or cock is to be fitted to the after bulkhead, to allow water to reach the pumps when required.

6. **Tunnel.**—The tunnel well is to be fitted with a steam pump suction.

7. **All Hand Pumps** are to be capable of being worked from the upper or main decks or above the Load Water Line, the bottoms of the pump chambers are not to be more than 24 feet above the suction rose, and the pumps are to be tested by the Surveyors to ensure that water can be pumped from the limbers. The sizes of the hand pumps are to be not less than those given in the following Table :—

Tonnage under Upper Deck.	Hand Pumps in Holds.	
	Diameter of Barrel.	Diameter of Tail Pipe.
	Inches.	Inches.
In vessels under 500 tons ...	4	2
„ 500 tons but under 1,000 tons	$4\frac{1}{2}$	$2\frac{1}{4}$
„ 1,000 „ „ 2,000 „	5	$2\frac{1}{2}$
„ 2,000 tons and above ...	$5\frac{1}{2}$	$2\frac{3}{4}$

In lieu of hand pumps in each compartment, an approved **fly wheel pump** may be fitted if it is connected to the steam pump bilge suction pipes of these compartments.

The hand pumps may be dispensed with in vessels which have two independent boiler rooms, or a donkey boiler above the bulkhead deck, and steam pumps (workable from either source of steam) in two separate compartments, connected to the suctions.

8. **No Sluice Valve or Cock** is to be fitted to the collision bulkhead.

9. **No Sluice Valves or Cocks** are to be fitted to the engine room or other watertight bulkheads unless they are arranged so as to be at all times accessible.

10. **When Sluice Valves** are fitted, they are to be so arranged as to be controlled above the Load Water Line, and the rods are to be boxed in to prevent injury.

11. **Sounding Pipes** are to be fitted on each side of holds and ballast tanks, and a doubling plate is to be fitted under each.

12. **Air Pipes** are to be fitted to each ballast tank as required.

13. All **Cocks and Valves** in connection with bilge and ballast suction pipes are to be fitted in places where they are at all times accessible.

14. All **Bilge Suction Pipes** are to be fitted with strum boxes or strainers, so constructed that they can be cleared without breaking the joints of the suction pipes. The total area of the perforations in the strainers should be not less than double that of the cross section of the suction pipe.

15. The **filling pipes for deep tanks** which can be used for either cargo or ballast must be controlled by valves placed in an accessible position, and so arranged that when the tank is being used for cargo it will be impossible to fill it with water. This result is to be obtained by taking out a short bend or wedge piece and fitting blank flanges in its place, or in some other way to be submitted to and approved by the Committee.

16. The **Pipes** for bilge or ballast suctions are to be fitted with flanged joints in convenient lengths, so that they may be easily disconnected for clearing. In the case of cast iron suction pipes, which are not also used as tank filling pipes, or which cannot be subjected to sea pressure, spigot and faucet joints made with india-rubber rings fitted over the spigots might be adopted, except in the case of bilge suction pipes passing through ballast tanks, which should be fitted with flanged joints.

17. The **Suction Pipes** to fore and after peaks, and to the tunnel well, should not be less than $2\frac{1}{4}$ inches inside diameter, except in vessels under 500 tons under deck, in which case they may be made 2 inches.

18. The **Bilge Injection** should not be less than two thirds of the diameter of the sea inlet to the circulating pump.

19. The **inside diameter** of other **bilge suction pipes** should not be less than given in the following Table :—

TONNAGE UNDER UPPER DECK.	Engine Room Centre Suction, Separate Donkey Suction, and Hold Centre Suctions.	Wing Suctions in Holds where no Centre Suctions are fitted, and Wing Suctions in Engine Room.	Wing Suctions in Holds where Centre Suctions are also fitted.
	Inches.	Inches.	Inches.
In vessels under 500 tons... ...	2	2	2
„ 500 tons but under 1,000 tons	$2\frac{1}{4}$	2	2
„ 1,000 „ „ 1,500 „	$2\frac{1}{2}$	$2\frac{1}{4}$	2
„ 1,500 „ „ 2,000 „	3	$2\frac{3}{4}$	$2\frac{1}{4}$
„ 2,000 „ „ 3,000 „	$3\frac{1}{2}$	3	$2\frac{1}{2}$
„ 3,000 tons and above ...	$3\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{3}{4}$

In cases where more than one suction to any one compartment are connected to the pumps by a single pipe, this pipe should be not less than the size required for the centre suction.

COCKS, VALVES, AND SOIL PIPES.

Section 40. 1. All **head and stern pumps** if fitted are to be provided with sea-cocks fitted to the outside plating to the satisfaction of the Surveyors, and in places where they are at all times accessible.

2. **Storm Valves.**—Where soil or scupper pipes are attached to the outside plating below or near the Load Water Line, storm valves are to be fitted in substantial metal castings other than cast iron. The lower length of pipe should be of

galvanized iron or steel of substantial thickness, not less than standard steam pipe quality and thickness, or if of lead it must be efficiently cased with zinc. Where passing through cargo or bunker spaces the pipes are to be protected by a substantial casing, but wood casing is not to be used in coal bunkers.

CEMENT.

Section 41. 1. The frames and plating of the bottom of all vessels to the upper parts of the bilges to be thickly and efficiently covered with Portland or other approved cement, which may be mixed with sand or other suitable substance. Care to be taken to have a proper thickness of cement at its termination, and to keep the watercourses clear all fore and aft. The whole to be to the satisfaction of the Surveyors.

2. Where **asphalt, enamel cement,** or similar compositions are to be used, the same must be sanctioned by the Owners, and samples are to be submitted for the approval of the Committee.

The condition of such compositions is to be ascertained by the Society's Surveyors biennially, and vessels coated with compositions as above described will be distinguished with a record of " Asp." in the Register Book.

CEILING.

Section 42. 1. **Close Ceiling.** All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed.

2. The **ceiling on the floors** of vessels not having double bottoms should be made in hatches where practicable, of convenient sizes, and when not so arranged to be fastened to the reversed angle bars or frames in such a manner as to be removed when required for the purpose of survey, or for cleaning and painting.

3. The **ceiling on the double bottom** of a cargo hold may be omitted, except under the hatchways and over the limbers at the bilges. If the ceiling is omitted under hatchways the tank top plating is to be increased ·08 inch in thickness in way of the hatchways. Where the manhole covers in the double bottoms of cargo holds, or their fittings, project above the tank top, and the ceiling is omitted, they must be protected by fitting an angle coaming around each manhole with a hatch either of wood or of steel fitted therein. Where the plating is protected with wood ceiling it should be $2\frac{1}{2}$ inches thick and laid on battens $1\frac{1}{2}$ inches thick, to admit of drainage water passing to the wells, or the ceiling may be laid on the top of the inner bottom embedded in a substantial covering such as Stockholm tar and cement. The ceiling on double bottoms to be removed when the tanks are required by the Rules to be tested.

4. **Thickness.**—The wood ceiling is to be 2 inches thick in vessels having a longitudinal number of 5,200 and under. In all larger vessels the ceiling is to be $2\frac{1}{2}$ inches in thickness.

5. **Cargo battens** to be fitted from the upper part of the bilges upwards, including the 'tween decks of all types of vessels, and in permanently enclosed spaces in bridges, poops and other deck erections. In spaces exclusively intended for carrying coal, cargo battens may be dispensed with.

6. **Vessels carrying coal, ore or wood.**—Vessels exclusively engaged in carrying coal, ore or wood need not have cargo battens fitted, but in each such case the certificate of classification will have the following words written on it, " Subject to the vessel being engaged exclusively in carrying coal, ore or wood, while without cargo battens."

STEERING GEAR.

(See also Table 25.)

Section 43. 1. **Rudder Stops.**—Suitable stops for the rudder should be securely fastened to the deck in way of the tiller or quadrant tiller. Where a suitable brake is fitted to the tiller or quadrant tiller, or where the steering quadrant is geared direct on to the steam steering engine, the deck stops may be dispensed with. The stops of the steam steering engines should be fitted at a smaller angle of helm than the rudder stops, so as to prevent excessive strains consequent on a rudder being forced against its stops.

2. **Spare Tiller.**—Vessels which have not two independent steering gears are to have spare tiller and gear ready for use when required.

3. **Independent Means of Steering.**—Where combined hand and steam steering gear is adopted, and in which both gears depend upon the efficiency of a keyed quadrant or tiller, independent means of steering must be provided.

Steamers above 250 feet in length are to be fitted with two independent steering gears, one of which must be a steam or other mechanical steering gear, and it is recommended that the two controlling wheels of the mechanical gear should be placed one at the gear and the other one on the navigating bridge.

4. **Protection of Steering Gear.**—In steamers above 250 feet in length, not having full poops or awning or shelter decks, the after steering wheel and gear are to be protected by a substantially constructed iron or steel deck house or hood.

5. **Springs** or **buffers** are to be fitted to all steam steering gears of steamers.

6. **Steering Chains or Rods.**—The diameters of steering chains or rods are to be as given in **Table 25** for the various diameters of rudder heads and the corresponding radii of quadrant tillers. Where the radius of quadrant or length of tiller adopted differs from that given in the Table, the diameter of steering chain is to be calculated from the following formula :—

$$d = \cdot 38\sqrt{\frac{D^3}{R}}$$

where d = diameter of chain in inches ;

D = diameter of rudder head in inches according to Table for rudder heads.

R = radius of quadrant or length of tiller at the centre of the chain in inches.

7. **Leads of Steering Chains.**—Care should be taken that the leads of the steering chains are made as direct as possible, sharp nips or bends being avoided.

8. The diameters at the centre of the chain of leading block sheaves are not to be less than sixteen times that of the steering chains, and the pins of the sheaves are not to be less than twice the diameter of the chains.

AWNING OR SHELTER DECK VESSELS AND VESSELS WITH PART AWNING DECKS.

Section 44. 1. In an awning or shelter deck vessel the transverse number is to be obtained from measurements taken to the deck next below the awning or shelter deck, provided the distance between these decks does not exceed 8 feet. Where the height of 'tween decks exceeds 8 feet the measurement is to be taken to a point 8 feet below the awning or shelter deck.

2. **Freeboard a condition of Class.**—It is a condition on which an awning or shelter deck, or part awning deck vessel is classed in the Society's Register Book that the freeboard assigned shall be marked on the vessel's sides as hereafter described.* The freeboard will also be inserted in the certificate of class and recorded in the Register Book. If the vessel proceed to sea with a less freeboard than that approved by the Committee, or if the freeboard mark be placed higher than the position assigned by the Committee, the vessel will be liable to have her class expunged from the Register Book.

3. **Forfeiture of Class.**—In all such cases, if the vessel has for any reason forfeited her class, the freeboard assigned as a condition of classification will be omitted in reprinting the Register Book, unless the class be previously reinstated.

4. **Notation in Register Book.**—Vessels to which this Section applies as regards an entire awning or shelter deck will be noted in the Register Book thus :—" Awng. dk." " Shelter dk." Those having a part awning deck will be noted " pt. Awng. dk."

5. **Deck Erections on Awning or Shelter Deck.**—When it is intended to fit erections on an awning or shelter deck, plans are to be submitted for the consideration of the Committee, showing the additional strengthening proposed to be fitted. Where a superstructure intended for passenger accommodation is to be built upon another superstructure, the deck beams above such accommodation are to be plated over in way of same.

6. **Scantlings and Riveting.**—The scantlings of the awning or shelter deck plating, side plating and stringer plates are to be as required by **Table 18.** The attachments and riveting of the butts, edges, &c., of the awning or shelter deck stringer and plating, sheerstrake and side plating are to be as required by **Tables 19, 20, and 21,** at an upper deck. The awning or shelter deck stringer angles are to be of the size given in **Table 18** for upper deck stringer angles.

7. **Framing.**—All the frames are to extend to the awning or shelter deck stringer plate, and they are to be of the sizes given in **Tables 2, 3, and 5,** but in no case are they to be less than $3\frac{1}{2}'' \times 3'' \times \cdot 30$ inch. The reverse frames are to extend to the height required by **Section 11.**

8. **Bulkheads and Casings.**—The collision bulkhead is in all cases to extend to the awning or shelter, or part-awning deck, the remaining bulkheads may stop at the deck

* See Notes of Freeboard requirements printed at end of Rules.

next below, but a deep web frame or partial bulkhead is to be fitted on each side in the 'tween decks in continuation of each watertight bulkhead fitted below. Engine and boiler room hatchways on the deck next below awning or shelter, or part awning decks, to be enclosed by steel or iron trunk bulkheads efficiently strengthened, and extended from that deck to the awning or shelter or part-awning deck. (*See* **Section 31, paragraphs 1 and 2.**)

9. **"Upper" Deck.**—The deck below an awning or shelter deck, or part-awning deck, is to be laid and caulked. Coamings and hatches are to be fitted as to a weather deck, but the height of the coamings may be as required at the deck below an upper deck. (*See* **Section 32.**)

10. **Deck Stringer to deck below awning or shelter deck.**—This deck stringer plate is to be fitted and connected to the outside plating by angle bars between the frames of the size given in **Table 17** for upper deck stringer angles in way of erections, and in addition, an inner stringer angle bar of the same size, passing continuously fore and aft, must be fitted inside the frames. The space between this angle bar and the outside plating all fore and aft, to be filled in and made watertight.

POOPS, BRIDGES, AND FORECASTLES.

Section 45. 1. **"Short" Deck Erections.**—In poops and forecastles, also in bridges not exceeding the lengths provided for in **Table 17**, the side plating, deck stringer plates and angles, tie plates and deck plating are to be of the scantlings required by that Table. The seams of the side plating may be single riveted except at the ends of the bridge, where they are to be double riveted for a length of about 20 feet. Where the bridge side plating is ·46 inch or above in thickness the seams are to be double riveted throughout the bridge. The butts of the side plating should be not less than double riveted.

2. **"Long" Bridges.**—Where the length of bridge exceeds that provided for in **Table 17** the scantlings of the bridge side plating, deck plating and stringer plates and angles are to be as required by **Table 18.** The attachments and riveting of the butts, edges, &c., of the bridge deck stringer and plating, sheerstrake and side plating are to be as required by **Tables 19, 20, and 21.** Where the seams of the side plating may not be required to be double riveted throughout, they must be double riveted for a length of about 20 feet at the ends of the bridge.

3. **Framing.**—All frames are to extend to the poop, bridge, or forecastle stringer plate. Partial bulkheads are to be fitted in bridges in way of large deck houses, also in continuation of watertight bulkheads fitted below, and at such other places as may be considered necessary by the Surveyor.

4. **Reversed Frames in Forecastles.**—In top-gallant forecastles of vessels whose longitudinal number is 14,000 and above, the alternate reversed frames are to extend to the forecastle deck, or other efficient means of strengthening the forecastle may be adopted if approved by the Committee.

5. **Beams and Pillars.**—The poop, bridge, and forecastle beams are to be of the sizes given in **Table 12,** and placed at every alternate frame. Where an iron or steel bridge deck is fitted, the beams are to be of the sizes given in **Table 11,** and placed at every frame unless the iron or steel deck is sheathed with wood, in which case the beams may be placed at alternate frames, except in vessels over 450 feet in length, when the beams are to be fitted at every frame whether the plating is sheathed or not. (For diameter of pillars, *see* **Tables 14 and 15.**)

6. **Upper Deck Stringer Plate.**—The upper deck stringer plate in way of the deck erections is to be fitted and connected to the sheerstrake by angle bars between the frames, of the size given in **Table 17,** and in addition an inner stringer angle bar of the same size passing continuously fore and aft must be fitted inside the frames. The space between this angle bar and the sheerstrake to be filled in and made watertight.

7. **Wood Decks.**—The wood decks of these erections are to be as stated in **Section 26.**

8. **Strengthening at ends of Bridges and long Poops.**—The upper deck sheerstrake is to be doubled its full breadth with plates not less than 20 feet in length and the stringer plate doubled or increased in thickness at the ends of a bridge. This additional strengthening is also required at the fore end of a poop or after end of a forecastle which exceeds one-fourth of the vessel's length. The bulwark plating at these parts is to be increased in thickness and supported by bracket plates; the freeing ports should have rounded corners and substantial rims, and the nearest stanchions to the ends of bridge or front of a long poop are not to be more than 5 feet from bridge or poop bulkhead and to be of additional strength, to the satisfaction of the Surveyors.

9. **Superstructures.**—Where a superstructure intended for passenger accommodation is to be built upon another superstructure, the deck beams above such accommodation are to be plated over in way of the same.

10. **Vessel's Proportions.**—All vessels having a length of $13\frac{1}{2}$ depths and above to the upper deck are to have a bridge extending over the midship half length of the vessel or such special compensation for extreme proportions as may be required by the Committee.

11. **Poop and Bridge Bulkheads.**—Bulkheads at the fore end of all bridges and poops are to be of the thickness required for the side plating of short bridges, but need not exceed ·40 of an inch in thickness, with coaming plates ·04 of an inch thicker than the bulkheads. Those erections extending over the engine and boiler or other deck openings, are to have the bulkheads stiffened with bulb angles of the sizes stated in subjoined Table.

Breadth of Ship.	Size of Bulb Angle Stiffeners.	Breadth of Ship.	Size of Bulb Angle Stiffeners.
Feet.	Inches.	Feet.	Inches.
24	5 × 3 × ·40	46	$7\frac{1}{2} \times 3\frac{1}{2} \times$ ·56
30	6 × 3 × ·44	50	$8 \times 3\frac{1}{2} \times$ ·64
36	7 × 3 × ·50	54	$8\frac{1}{2} \times 3\frac{1}{2} \times$ ·64
42	7 × 3 × ·56	58 and above	$9 \times 3\frac{1}{2} \times$ ·64

The stiffeners are to be spaced 30 inches apart, and connected both to the coaming plates and to the deck plating, or to an athwartship plate on the beams both below and above, with a bracket plate to each end of the bulb stiffener. Bulkheads at the fore end of poops not extending over engine and boiler, or other deck openings, to be stiffened with plain angles of the size required for frames in the fore and after peaks, spaced 30 inches apart. The bulkheads at the ends of all poops, bridges, and forecastles are to be placed over a deck beam.

12. **Deck Erections on Small Vessels.**—Where it is proposed to fit a poop, bridge, or top-gallant forecastle to a vessel whose moulded depth is less than 15 feet, plans showing the proposed additional transverse strengthening are to be submitted for the consideration of the Committee.

RAISED QUARTER-DECKS.

(See also Sketches on page 144.)

Section 46. 1. **Framing and Side Stringers.**—The scantlings and arrangements of framing and side stringers in the way of a raised quarter-deck must be in accordance with the Rules for the increased depth of vessel, having regard to the position of the lowest tier of beams, as described in **Section 2, paragraph 4.**

2. **Side Plating and Deck Stringers.**—The scantlings of raised quarter-deck stringer, sheerstrake and strake below are to be as required by the Rules for a vessel of the depth and proportions to the raised quarter-deck.

3. **Beams.**—The size of beams of raised quarter-deck to be regulated as prescribed in **Tables 11, 12,** and **13.**

4. **Strengthening at Break.**—The upper deck sheerstrake is to be extended for a reasonable distance abaft the break and to be doubled or increased in thickness in way of the same; except in the case of a raised quarter-deck connected to a long bridge, when the raised quarter-deck sheerstrake is to be doubled or increased in thickness at the break. The bulwark plates of the raised quarter-deck adjoining the bridge side plating are to be increased in thickness and the upper deck sheerstrake is to be doubled at the front of the bridge.

5. **Butt Connections.**—The butts of the deck stringers and side plating throughout are to be arranged clear of each other and in way of the break the butts of the raised quarter-deck sheerstrake and two strakes of plating below the same are to be at least treble riveted. The upper deck stringer plate is to extend abaft the break about seven frame spaces, and the raised quarter-deck stringer plate about four frame spaces before the break, and the stringer plates below the upper deck are to have a shift of about 16 feet overlap; the bridge stringer also is to extend abaft the break.

6. **Break Bulkhead.**—The front or break bulkhead of the raised quarter-deck is to be of the thickness of the side plating required by **Table 17** for short bridges. It is to be connected to the raised quarter-deck side plating by double angles, and is to be efficiently stiffened. An athwartship plate is also to be fitted, which will receive the deck ends, and be supported by bracket plates when it is not riveted to a beam. When the longitudinal number exceeds 15,000, or the vessel is over $13\frac{1}{2}$ depths to length at upper deck, the break bulkhead is to be not less than four frame spaces abaft the after end of the engine room opening.

7. **Overlap of Decks.**—In vessels requiring by **Table 18** a steel deck or part steel deck, the upper deck plating is to scarph the raised quarter-deck for a length of two to three

frame spaces, according to the size and proportions of the vessel, and the raised quarter-deck side plating is also to be doubled at this part for a length of from 18 feet to 20 feet. There are to be from four to five diaphragm plates fitted, of the thickness of the upper deck plating, connecting the two decks. They are to be attached to the decks and bulkhead by double angles, and stiffened by an angle on the after edges, also they are to be associated with web plates not less than 15 inches deep, fitted on the fore side of the bulkhead in the way of the same, and efficiently bracketed to the upper and bridge deck plating.

Where the longitudinal number is 18,200 and under 19,500, the main and raised quarter-decks are to be scarphed four frame spaces, and where the longitudinal number is 19,500 and above, five frame spaces. The webs on the fore side of the break bulkhead are to be not less than 18 inches deep. In such vessels the raised quarter-deck side plating is to be doubled, commencing at one-fourth the length of the vessel from the stern and extending to 8 feet beyond the break of the raised quarter-deck.

Vessels which from their size and proportions do not require the decks to be scarphed, are to have from four to five bracket knees fitted on each side of the break bulkhead, the thickness of which is not to be less than that of the upper deck plating.

SAILING VESSELS.

Section 47.—The foregoing requirements for steamers are also applicable to sailing vessels except as regards the following particulars :—

1. All the **reversed frames** are to extend to the upper deck in sailing vessels having more than one tier of beams.

2. Sailing vessels of 20 ft. and under 33 ft. moulded depth are to have at least one tier of beams, spaced not more than two frame spaces apart, below the upper deck.

3. Sailing vessels of 22 ft. and under 27 ft. moulded depth are to have a **deep web frame**, of the breadth and thickness of the stringer plate at second deck, fitted in way of each mast and connected to the outside plating with double angles. These web frames are to extend to the upper deck stringer plate.

4. Where the moulded depth is 27 ft. and under 33 ft., instead of the deep web frames prescribed in the preceding paragraph, **partial bulkheads**, as shown by the **Sketch** on page 145, are to be fitted in way of each mast.

5. Where a system of web frames as required by **Section 13** is adopted, the web frames are to extend in all cases to the upper deck. Where the moulded depth is 22 ft. and under 27 ft., the web frames in way of the rigging of each mast are to be spaced not more than 4 frame spaces apart. Where, however, the moulded depth exceeds 27 feet, partial bulkheads are to be fitted as required by **paragraph 4** of this section, when the web frames in way of the rigging may be of the ordinary spacing.

6. **Panting Arrangements.**—The stringer plates on all tiers of panting beams are to be of the breadth and thickness required by **Table 17** for the second deck stringer plates at ends, and are to extend abaft the collision bulkhead for a length of not less than one-fourth the midship breadth of the vessel, attached to the outside plating and efficiently supported by brackets at alternate frames.

Sketches of panting arrangements are in all cases to be submitted for approval.

In sailing vessels of 20 ft. moulded depth and above panting beams and stringers are to be fitted at the after end.

7. Where the length of the midship beam is less than 30 feet, the upper and lower **deck beams** are to be $\frac{1}{2}$ inch deeper than given in **Tables 11** and **12** for upper deck beams of the same length in steamers where one tier of beams only is fitted; and where the length is 30 feet and above, the upper, lower and orlop deck beams are to be one inch deeper than given in the Tables. The depths of the beam knees are to be correspondingly increased.

8. Where plate knees are not fitted the beam knees are to be "turned."

9. **Outside Plating.** — The outside or overlapping strakes of plating for one quarter the length at the fore end should be reduced not more than ·06 of an inch from the midship thickness. Where the longitudinal number is under 11,000 the sheerstrake is to be increased ·06 of an inch in thickness, and where the longitudinal number is 11,000 or above it is to be increased ·10 of an inch in thickness, in each case for $\frac{3}{4}$ths the vessel's length amidships. In addition, when the longitudinal number is 13,000 or above, three strakes of plating at the bilges are to be increased ·06 of an inch in thickness throughout. When the longitudinal number is 17,000 and above, the strake of plating in way of the beams to second deck is to be increased ·06 of an inch in thickness for one-half the vessel's length amidships.

10. In sailing vessels only the foremost or **collision bulkhead** will be required, and it is to be placed at not less than one-half the vessel's midship breadth abaft the stem at the lower deck.

11. **Diagonal tie plates** are to be fitted on the beams of all sailing vessels in way of the masts at the deck on which they are wedged; and, in addition, where the longitudinal number is 11,000 and above diagonal tie plates are to be fitted all fore and aft on the upper deck. Where diagonal tie plates cross each other, or the fore and aft tie plates between the beams, and a deck is to be laid thereon, one set of tie plates must be set down in way of the crossing, so as to leave one thickness only projecting above the beams. The diagonal tie plates are to be of the width and thickness given in **Tables 17** and **18.** They are to be well riveted to each other and to the beams and stringers.

12. **Bulwark Stanchions.**—The stanchions which support the bulwarks are not to be more than 5 ft. apart. Where stanchions are fitted on the butt straps of the bulwark plating, the straps are to be sufficiently broad to receive the spur in the middle of the stanchion, and the bulwark plating is to be doubled or fitted with vertical straps in way of the intermediate stanchions. The heel of each stanchion is to be attached by not less than four $\frac{7}{8}$ in. bolts, tapped through the stringer plate and secured with a nut and grommet. Their size may be from $1\frac{3}{8}$ in. to 2 in. in diameter, regulated by the length of the stanchion and the size of the vessel. Other forms of stanchion may be adopted, provided they be submitted for approval.

13. The **mast rings** in sailing vessels are to be formed of bulb angle of the size required by the Tables for frames in fore and after peaks.

14. The **chain plates, rigging,** &c., are to be in accordance with the requirements of **Table 28.**

15. **Hand pumps** only are required to be fitted to sailing vessels, and they are not to be of less size than required by **Section 39, paragraph 7.**

VESSELS NOT BUILT UNDER SURVEY.

Section 48. 1. In cases of vessels not surveyed while building, for which a character may be required application must be made to the Committee in writing, and such drawings, with scantlings of the vessel marked thereon, as may be obtainable, should be furnished, also particulars of the testing of the steel used in the construction of the vessel. The Committee will then direct a special examination to be made by two Surveyors of the Society (one of whom shall be an exclusive officer), for which purpose the vessel is to be placed on high blocks in a dry dock or on ways ; the hold to be cleared and proper stages made ; the rivets and plating of keel, and flat of bottom, thoroughly examined ; the close ceiling in the hold to be removed where deemed necessary, but in no case less than required for **Special Survey No. 2.** The coal bunkers of steam vessels to be cleared ; the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets, and inner surface of the plating exposed to view ; all oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, stern-post, and rudder.

In cases where the inner surface of the bottom plating is coated with cement or asphalt, if the coating be carefully inspected, and tested by beating or chipping and found sound and adhering satisfactorily to the steel, its removal may be dispensed with, provided that upon the removal of a portion, the plating, frames, and rivets under it be found in satisfactory condition.

2. When the vessel is so prepared, the Surveyors are to ascertain the scantlings of the various parts, and verify the particulars given on the drawings furnished, drilling the shell plating where deemed necessary for this purpose. A few rivets are to be removed from various parts to ascertain their quality and the character of the countersinking and workmanship. A full report is to be made on a first entry report form for the information of the Committee, who will then assign the vessel such character as the facts may appear to them to warrant.

3. In addition to the above, if the age of the vessel be ten years or upwards, the requirements of the **Special Survey No. 3** are to be complied with. The periodical surveys are subsequently to be held as in the case of vessels built under survey.

4. In steam vessels the **Engines** and **Boilers** are to be opened out for Survey, at least to the extent required for the **Special Surveys Nos. 1, 2, and 3.** The Screw Shaft is to be drawn and examined. The arrangements of sea cocks, bilge suctions, valves, &c., are to be made to conform to the requirements of the Rules, and the working pressure of the boilers is to be determined from their actual scantlings in accordance with the Rules for the construction of boilers, and particulars should be furnished respecting the testing of the steel.

RULES FOR THE BURNING AND CARRYING OF LIQUID FUEL.

Section 49. 1. In vessels fitted for burning liquid fuel, the record "Fitted for liquid fuel" will be made in the Register Book.

2. The compartments for carrying oil fuel must be strengthened to efficiently withstand the pressure of the oil when only partly filled and in a seaway. They must be tested by a head of water extending to the highest point of the filling pipes or 12 feet above the load line, or 12 feet above the highest point of the compartment, whichever of these is the greatest.

3. If peak tanks or other deep tanks are used for carrying liquid fuel the riveting of these should be as required in the case of vessels carrying petroleum in bulk. The strengthening of these compartments must be to the Committee's satisfaction.

4. Each compartment must be fitted with an air pipe to be always open discharging above the upper deck.

5. Efficient means must be provided by wells and sparring or lining to prevent any leakage from any of the oil compartments from coming into contact with cargo or into the ordinary engine room bilges.

6. If double bottoms under holds are used for carrying liquid fuel, the ceiling must be laid on transverse battens, leaving at least 2 inches air space between the ceiling and tank top and permitting free drainage from the tank top into the limbers.

7. The pumping arrangements of the oil fuel compartments and their wells must be absolutely distinct from those of other parts of the vessel and must be submitted for approval.

If it is intended to sometimes carry oil and sometimes water ballast in the various compartments of the double bottom, the valves controlling the connections between these compartments and the ballast donkey pump, and also those controlling the suctions of the special oil pump, must be so arranged that the suctions for each separate compartment cannot be connected at the same time to both pumps.

8. No wood fittings or bearers are to be fitted in the stokehold spaces.

9. Where oil fuel compartments are at the sides of, or above, or below the boilers, special insulation is to be fitted where necessary to protect them from the heat from the boilers, their smoke boxes, casings, &c.

10. If the fuel is sprayed by steam, means are to be provided to make up for the fresh water used for this purpose.

11. If the oil fuel is heated by a steam coil the condensed water should not be taken directly to the condensers but should be led into a tank or an open funnel mouth, and thence led to the hot well or feed tank.

12. The above arrangements are applicable only to the case of oil fuel, the flash point of which as determined by Abel's close test does not fall below 150° Fahrenheit.

EQUIPMENT.

Section 50. 1. All vessels having **masts, spars, rigging,** and **sails** shall be required to have them maintained in good order.

2. Every ship is to be provided with **anchors, cables, &c.,** of approved quality, tested at a *public machine* recognised by the Committee, in number and length as set forth in **Tables 30 and 31.**

3. To entitle vessels classed A "For Channel Purposes" to the Figure 1, the equipment of Anchors and Chain Cables, &c., should be as required by **Table 31,** with the exception that not more than two bower anchors and one stream anchor need be supplied. The first bower anchor should be of the full weight required by the Table, and the second bower may be 15 per cent. lighter. This rule, however, applies only to vessels intended for short passages.

4. In vessels classed "For Channel Purposes" which are intended for longer voyages, such as the Queenboro'-Flushing, the Channel Islands, or the Irish Sea service, the equipment must be in accordance with the requirements of **Table 31.**

5. In the cases of **foreign owned vessels** classed with the Figure 1, in which the chains and anchors, or part of the same, have been tested under the inspection of the Society's Surveyors at Proving Establishments out of the United Kingdom recognised by the Committee, and test certificates of the same are furnished, duly signed by the Society's Surveyors and the Secretary, the vessel will have recorded in the Register Book the notation A.&C.P., A.P. or C.P. as the case may be. Where, however, the anchors or

cable for foreign owned vessels are manufactured abroad and test certificates are furnished setting forth that they have been tested at a Government machine, or at a machine under the control of a municipal body or a similar responsible body, but not under the inspection of a Surveyor to the Society, the record of A.&C.P., &c. will not be made in the Register Book, though such certificates will be accepted, as complying with the requirements of the Rules, for assigning the Figure 1, provided the remaining requirements of **Tables 30** and **31** be complied with.

6. **A certificate** of all chains and anchors having been tested, and of the strain applied to them, must be produced before the ship is classed with the Figure 1.

7. **Equipment Number.**—The equipment as regards anchors, chains, warps, &c., is to be regulated by the number produced by the sum of the measurements in feet of the greatest moulded breadth of the vessel and the depth from the upper part of the keel to the top of the upper deck beams at side at the middle of the length, multiplied by the length of the vessel. In awning or shelter deck or part awning deck vessels, the measurement of depth defined above is to be taken to the deck next below the awning or shelter deck, provided the height between the decks does not exceed 8 feet. If the 'tween deck height exceeds 8 feet the measurement is to be taken to a point 8 feet below the awning or shelter deck. In turret deck vesseis it is to be taken to the normal beam line at base of turret.

For a vessel having **erections** on deck the number obtained by the previous paragraph is to be increased as follows :—

For a raised quarter deck, add the product of the height and length in feet of the erection.

For an awning or shelter deck, part awning deck, poop, bridge or forecastle, add three-fourths the product of the height and length in feet of such erections, 8 feet being taken as the maximum height for awning or shelter deck, or part awning deck erections.

For deck houses or other erections not extending to the side, but exceeding either in length or breadth half the rule breadth of the vessel, add one-half the product of the height and length of such erections.

Where erections are fitted upon erections the equipment number is to be correspondingly increased.

8. The equipment for **Sailing and Steam Trawlers and Tugs** is to be as given on back of **Tables 30** and **31.**

9. All vessels under 150 tons to be provided with one good boat; and every vessel of 150 tons and above to have a suitable number. The Surveyors are to be particular in examining and reporting the condition of the boats of all vessels.

10. **Anchor Cranes** and **Boats' Davits** to be in accordance with **Table 29.**

11. The efficient state and condition of the whole of a vessel's equipment will be designated by the Figure 1 placed after the character assigned to the vessel; and in cases in which the equipment is found insufficient in quantity or defective in quality, a dash thus—, will be inserted in place of the Figure 1. In cases where the Figure 1 is expunged on account of deficiencies in the anchors or chains, the record of Lloyd's A.&C.P. or A.&C.P. will also be expunged.

71, Fenchurch Street, London, E.C.
11th May, 1911.

By order of the Committee,

ANDREW SCOTT,
Secretary.

RULES FOR THE CONSTRUCTION OF VESSELS INTENDED TO CARRY OIL IN BULK.

GENERAL.

Section 51. 1. **The scantlings, arrangements and equipment,** also the Rules for Special and other surveys and all requirements relating to vessels intended for the carriage of oil in bulk are to be as prescribed by the Society's "Rules for the construction of Steel Vessels," except where otherwise specified by the following Rules and Tables.

2. **Submission of Plans.**—In addition to the usual sketches of Midship Section, profile and deck plans, sketches are to be submitted showing the arrangement of oil tanks and cofferdams, the stiffening proposed for the transverse and longitudinal bulkheads, the construction of the tunnel and the bracket attachments at the ends of beams, stringers, webs, bulkhead stiffeners, &c.

3. **Length of Oil Compartments.**—The oil compartments are not to exceed from 24 feet to 28 feet in length.

4. **Expansion trunks** are to be fitted over the oil compartments of sufficient capacity to admit of the expansion or contraction of the oil due to changes of temperature. They are to be so arranged that the surface of the oil will not fall below the sides of the trunks when the vessel is rolling or pitching in a seaway. The breadth of the expansion trunk is not to exceed one-half the moulded breadth of the vessel, and where the height of the trunk exceeds eight feet above the top of the oil compartments the scantlings in way of the oil compartments are to be increased.

5. **Cofferdams** are to be fitted at the fore and after ends of the space intended for the oil cargo, and where the machinery is fitted amidships cofferdams are also to be fitted at each end of the machinery space in order that the oil cargo may be isolated from the holds and from the engine and boiler spaces. The cofferdams are to be not less than two frame spaces in length and are to extend from the keel to the top of the continuous expansion trunk for the full breadth of the vessel.

6. The **number of watertight bulkheads** extending to the upper deck is to be as required by **Section 19.**

7. **Deck Erections.**—In vessels having the machinery aft, a poop must be fitted of sufficient length to cover the machinery space. Where the engines are fitted amidships, the bridge is to be of sufficient length to overlap the ends of the middle line bulkhead in the oil compartments.

8. **Cement.**—Portland Cement may be dispensed with in compartments intended for carrying oil in bulk.

9. **Testing.**—Each oil compartment is to be filled separately with water and tested by pressure before the vessel is launched, or while in dry dock. The pressure is to be obtained by means of a head of water eight feet above the highest point of the expansion trunk. Cofferdams are to be tested by being filled with water to the top of the hatchway.

10. **Electric light** is to be fitted throughout on the double wire system.

WORKMANSHIP.

Section 52. 1. Owing to the penetrating character of the oil and the stresses to which oil vessels are subjected, due to the cargo being carried directly upon the outside plating of the vessel, it is of primary importance that the **workmanship** throughout be **of the highest character.**

2. The **butts of plating** to be planed and fitted close ; the **edges** of the plating to be sheared from the faying surfaces, or the "burr" caused by shearing to be carefully chipped off, and all outside edges of plating are to be either planed or chipped fair. The butts and edges to be carefully caulked.

3. The **riveting** is to be of the most efficient character and the points of the rivets left full or convex. Special care is to be taken in the punching and countersinking of the holes and the fitting together of the various parts. Where any unfairness exists in the holes they are to be rimered, not

drifted, and larger rivets used in the rimered holes. The "burr" caused by punching, and all drillings and rimerings must be removed before the different parts are screwed together for riveting. Where the heads of the rivets are not laid up close to the plating or angle bars, or where rivets when tested are found unsatisfactory they are to be removed, not caulked. All oil-tight joints are to have the surfaces of steel plates fitted close to each other and caulked, without, as far as practicable, the use of canvas, &c.

4. In oil-tight work **all angles** are to be **welded at the corners** and neither mitred nor overlapped.

5. The **angles attaching bracket plates** to the bulkheads are to extend along the bulkhead six inches beyond the points of the bracket plates. The bracket plates and angles are to be kept sufficiently clear of the bulkhead boundary bars to admit of the latter being efficiently caulked.

6. Where the **boundary bars** of oil-tight bulkheads consist of double angles, both flanges of each bar are to be caulked.

FLAT KEEL AND VERTICAL KEEL PLATES.

Section 53. 1. **Flat plate keels** are to be of the dimensions given in **Table 17.** The **vertical keel plate** forming the lowest strake of the middle line bulkhead is to be of sufficient breadth to admit of the seam at upper edge being above the upper end of the brackets attaching the floor plates to the bulkhead, and its thickness is to be ·10 of an inch more than the thickness required by **Table 33** for floor plates.

2. **Keel Angles.**—The angles connecting the vertical keel plates to the flat keel plates, are to be of the dimensions given in **Table 34.**

FRAMES AND REVERSED FRAMES.

Section 54. 1. The dimensions and spacing of the **frames and reversed frames** are to be as given in **Table 32.**

2. **Bulb angle frames** will not be required to extend to the middle line, provided they be carried down round the bilge and be scarphed to angle frames fitted at the lower edges of the floor plates. The scarphs are to be in length not less than six times the depth of the bulb angle frames and the butts are to be shifted on adjacent floors not less than the length of the scarph. In these cases the angle frames are to be of the same thickness as the floors, and their flanges of the breadth required for the fore and aft flanges of frames by **Table 32.** The angle and bulb angle frames are to be fitted on opposite sides of the floor plates.

3. When bulb angle frames are extended to the middle line they are to have a lap of not less than $4\frac{1}{2}$ inches with the floor plates.

4. In all cases the frames are to be cut in way of the deck forming the top of the tanks.

5. The **frames in the 'tween decks** may be of angles ·06 of an inch thicker than required by **Table 32,** in which case the reversed frames may be dispensed with, and they must be bracketed to the tank deck stringer at heel and to the beams above.

6. The **brackets** at the heels of the 'tween deck frames are to be of the same thickness as the frames, and are to be attached to the tank deck by double or single angles as required by **Table 36** for the attachment of bulkheads to tank deck. The brackets are to measure along each edge not less than five times the depth of the standing flange of the frames to which they are to be double riveted.

7. **Web Frames in 'tween decks.**—Web frames or partial bulkheads of the dimensions given in **Table 32** are to be fitted in the 'tween decks in line with the bulkheads and web frames fitted below. They are to be stiffened at their inner edges by angle bars, or the plates may be flanged.

8. **Reversed Frames on Floors.**—A reversed frame is to be fitted at the upper edge of each floor plate, of the dimensions required for double angles at face of web frames by **Table 32.**

9. **Height of Reversed Frames.**—Where the intermediate frames are formed of frames and reversed frames riveted together, all reversed frames are to extend to the deck at the top of the oil compartments.

FLOOR PLATES.

Section 55. 1. The **floor plates** are to be of the dimensions given in **Table 33,** and are to extend in one length from the middle line bulkhead to the bilge.

2. **Height of Floor Ends.**—The floors may be either turned up at the bilge to a vertical height of not less than twice the midship depth of floor above top of keel throughout the oil compartments, or bracket plates of the thickness of the floors may be fitted at the bilge extending to the same height.

3. **Moulding of Floor Plate.**—The **brackets at bilge** are to be attached to the floor plates by means of a double riveted overlap not less in length inside the frame than the midship depth of floor; and the depth of the floor plate at three-fourths the half moulded breadth of vessel from middle line, or at the inner end of the bracket, is to be not less than three-fourths the depth of floor amidships. The upper edge of the floor is, however, at no part to fall below the level of the upper edge of the floor at middle line. The rivet attachment of the bracket to the frame bar is not to be less than that to the floor.

4. **Bracket plates** are to be fitted attaching the floor plates **to the middle line bulkhead.** They are to be of the thickness of the floors, and are to measure along each edge clear of the attachments not less than the midship depth of floor plate. The brackets are to be attached to the floors by double riveted overlaps, and the floors and brackets are to be attached to the middle line bulkhead on one side by double attachment angles, and on the opposite side by double angles consisting of the vertical stiffener on middle line bulkhead and a short attachment angle extending from the keel to beyond the point of the bracket.

5. The floor brackets both at middle line and bilge are to be stiffened at their inner edges by angle bars, or the bracket plates may be flanged.

6. The **floor plates at the transverse bulkheads** are to be increased to twice the Table depth and their thickness is to be as required by **Table 33**, but in no case less than that of the bulkhead plating to which they are attached.

7. The **floor plates to which web frames** are attached are to be at no part less in depth than the depth of the web frames.

SIDE AND BILGE KEELSONS.

Section 56. 1. **Intercostal keelsons** are to be of the scantlings given in **Table 34.** The intercostal plates are to be closely fitted between the floor plates and attached to the outside plating by angles of the size required by **Table 32**, these angles are to be double for a length of three frame spaces on each side of the bulkheads.

2. **Number of Keelsons.**—Two intercostal keelsons are to be fitted on each side where the moulded breadth of vessel amidships is less than 50 feet, and three where the breadth is 50 feet and under 64 feet. Where three keelsons are required each is to be fitted with a vertical plate of three-fourths the depth given in **Table 34.**

3. **Attachment of Keelsons to Bulkheads.**—The keelsons are to be cut at the transverse bulkheads, to which they are to be attached, by brackets of the thickness of the floor plates measuring not less than two frame spaces in length along each edge from the bulkhead and top of floor. They are to be connected to the bulkhead on one side by double attachment angles, and on the other side by the vertical stiffeners or webs on the bulkheads, with an additional attachment angle in the way of the brackets, see **Sketch** on page 148.

4. The keelson brackets are to be stiffened at their inner edges by angle bars, or the plates may be flanged.

5. Where it may be desired to modify the arrangements of floors and keelsons, alternative proposals are to be submitted for approval.

WEB FRAMES AND SIDE STRINGERS.

Section 57. 1. **Web frames** and **side stringers** are to be fitted throughout the oil compartments and machinery space, and are to be as given in **Table 32.** The web frames are to be spaced not more than four frame spaces apart, and the side stringers as required by the Table.

2. The web frames are to be attached to the floors by treble riveted overlaps, and their heads are to be attached to strong beams and brackets at the tank deck; they are to be continuous from the floors to the top of the oil compartments, the stringers being fitted intercostally.

3. **Face angles** of the dimensions given in **Table 32** are to be fitted at the inner edges of the web frames and stringer plates. Those on the web frames are to extend along the upper edges of the floor plates to within the outer keelson. The face angles on the stringer plates are to be connected across the face of the webs by buttstraps of the dimensions given in **Table 32.**

4. **Attachments.**—The stringer plates are to be closely fitted between the web frames. The double angles connecting the stringers to the web frames, and the angles connecting the stringers and web frames to the outside plating, are to be of the size required by **Table 32.** Where the depth of web frames is 24 inches or above, the web frames are to be attached to the outside plating by double angles, or by equivalent single angles double riveted. The stringer plates are to be attached to the outside plating by double angles for a length of three frame spaces on each side of the bulkheads.

5. **Brackets under stringers.**—Where the side stringers are 16 inches and above in depth they are to be supported

by bracket plates fitted midway between the web frames, efficiently riveted to the frames and connected to the stringer plates by single attachment angles.

6. **Brackets to bulkheads.**—The stringers are to be attached to the transverse bulkheads by large bracket knee plates of the thickness of the stringer plates, extending fore and aft for a distance of three frame spaces from the bulkhead, or inner edge of horizontal girder, and transversely for two frame spaces from the inner edge of the stringer plate. The brackets are to be attached to the stringer plates by double riveted overlaps and to the bulkheads, on one side by double attachment angles, and on the opposite side by a double riveted overlap to the horizontal stiffener on the bulkhead ; an additional attachment angle is to be fitted connecting the horizontal stiffener to the bulkhead in way of the brackets. (*See* **Sketch** on page 150.)

7. The brackets attaching the stringer plates to the bulkheads are to be stiffened at their inner edges by angle bars, or the bracket plates may be flanged.

TRANSVERSE BULKHEADS TO OIL COMPARTMENTS.

Section 58. 1. The transverse oil-tight bulkheads are to be of the **thickness** given in **Table 35,** and are to extend to the top of the expansion trunk.

2. **Boundary angles.**—The bulkheads are to be attached to the outside plating, to the tank deck and to the sides and top of the expansion trunk by angles of the dimensions given in **Table 36.**

3. **Bulkhead liners** are to be fitted to the outer strakes of outside plating of sufficient length to take one row of rivets clear of the bulkhead frames, these rivets are to be closely spaced to admit of the ends of the liners being efficiently caulked.

4. **Bulkhead stiffeners.**—The bulkheads are to be supported by means of vertical bulb angle stiffeners and web plates and horizontal girders, of the dimensions given in **Table 35.** (*See* also **Sketches** on page 148.)

5. The **vertical bulb angle stiffeners** are to be spaced as required by **Table 35,** and their ends are to be kept sufficiently clear of the bulkhead boundary angles to admit of these being caulked.

6. The heels of the stiffeners are to be attached to the outside plating by **bracket plates** two frame spaces in length, and of a height equal to once and a half the depth of the floors measured from the outside plating, the floor plate adjacent to the bulkhead being dispensed with to admit of the brackets being fitted as described. The brackets are to be attached to the floor plates and outside plating by single attachment angles, and are to be of the thickness required by **Table 33** for floor plates amidships. They are to be stiffened along their upper edges by angle bars, or the plates may be flanged.

7. The heads of the bulb angle stiffeners are to be attached to the under side of the tank deck plating, or to a shelf plate in way of expansion trunk by **bracket plates** one frame space in length and in depth.

8. Vertical **web plates** of the dimensions required by **Table 35** are to be fitted, extending from the keelson brackets to the tank deck, or top of the expansion trunk. Two web plates are to be fitted on each side of the middle line where the breadth is under 50 feet, and three on each side where the breadth is 50 feet and under 64 feet. The webs are to be attached to the bulkheads by single attachment angles. Double angles are to be fitted attaching the heads of the webs to the tank deck plating, or shelf plate. The heels of the webs are to be attached to the keelson brackets as shown by **Sketch** on page 148. The inner edges of the web plates are to be stiffened by angle bars or the plates may be flanged.

9. **Horizontal girders** in number and dimensions as given in **Table 35** are to be fitted in line with the side stringers and extending from the middle line bulkhead to the sides of the vessel. Where plate girders are fitted they are to be connected to the transverse bulkheads by single attachment angles. The ends of the girders are to be attached to the sides of the vessel by means of the side stringer brackets and to the middle line bulkhead by brackets of the thickness of the side stringer plates, extending fore and aft and athwartships for a distance of two frame spaces and arranged as shown in **Sketch** on page 150. The inner edges of the brackets are to be stiffened by angle bars, or the bracket plates may be flanged.

10. The vertical web plates and horizontal girders are to be supported by **brackets** to prevent them from tripping.

11. In the **expansion trunk** the transverse bulkhead is to be stiffened by vertical angles as required by **Table 35,** bracketed at head and heel.

12. It is recommended the bulkhead plating be fitted vertically with the edges of the plating between the vertical stiffeners.

COFFERDAMS.

Section 59. 1. The **cofferdam bulkheads** are to be of the same thickness, and are to be attached to the outside plating, decks, &c., as required for the transverse bulkheads to the oil compartments.

2. **Bulkhead stiffening.**—The bulkheads are to be stiffened by bulb angles of the same size and spacing as required for the bulkheads in the oil compartments. The two bulkheads forming a cofferdam are to be tied together at each of the vertical stiffeners by a series of plate stays efficiently riveted to the vertical stiffeners, and flanged on the upper and lower edges, as shown in **Sketches** on pages 146 and 147.

3. The **keelsons and side stringers** are to be continued in the cofferdams by plates of the same thickness as the floor plates and extending to the inner ends of the keelson and stringer brackets. The plates are to be connected to the outside plating by double angles, and to the cofferdam bulkheads by the vertical stiffeners and doubling angles, the inner edges of the plates are to be stiffened by angle bars, or the plates may be flanged.

4. The vertical **bulb angle stiffeners** are to be bracketed at their ends as required at the other transverse bulkheads. Where cofferdams do not exceed two frame spaces in length the **floor** in the cofferdam may be dispensed with provided the lower ends of the stiffeners be connected by fore and aft plates of the depth and thickness of the floor plates amidships. The **beam** at the upper part of the cofferdam may also be dispensed with, provided the upper ends of the stiffeners be connected by fore and aft plates similar to those at the lower ends, but of three-fourths the depth. These connecting plates at the upper and lower ends of the stiffeners are to have angle bars on their inner edges or the plates may be flanged; they are to be connected to the deck and outside plating by single attachment angles.

MIDDLE LINE BULKHEAD.

Section 60. 1. Throughout the oil compartments and cofferdams an oil-tight middle line bulkhead of the **thickness** required by **Table 35** is to be fitted extending from the keel to the top of the expansion trunk. Beyond the cofferdams arrangements are to be made to avoid an abrupt termination of the strength by the fitting of large webs, brackets, etc.

2. **Boundary Angles.**—The middle line and transverse bulkheads are to be attached to each other by double angles $3\frac{1}{2}'' \times 3\frac{1}{2}''$ for $\frac{3}{4}''$ rivets, and $4'' \times 4''$ for $\frac{7}{8}''$ rivets, and of the same thickness as required for the double frame angles at sides of vessel. The middle line bulkhead is to be attached to the plating at top of expansion trunk by double angles of the same size as those at the top of transverse bulkheads.

3. **Bulkhead stiffeners.** — The bulkhead is to be supported by means of vertical bulb angle stiffeners and web plates and horizontal girders, of the dimensions given in **Table 35.** (*See* also **Sketches** on page 149.)

4. The **Vertical bulb angle stiffeners** are to be spaced the same as the frames, and their lower ends are to be kept sufficiently clear of the keel angles to admit of these being caulked; they are to be attached to the floors and brackets by two rows of rivets. An additional attachment angle is to be fitted connecting the stiffener to the bulkhead in way of the floor plate and bracket. The stiffeners are to be attached at their heads to the bracket knees of beams crossing the expansion trunk at the tank deck, or be bracketed to a shelf plate fitted at the same height. Where a tunnel is fitted through the after oil compartments the vertical stiffeners are to be efficiently bracketed to the top of the tunnel.

5. Vertical **web plates** of the same thickness as the plating at lower part of bulkhead are to be fitted opposite the web frames at the sides of the vessel. Their depth at the heel is not to be less than that of the floors at middle line, and at the head not less than two-thirds that at the heel. The lower ends of the web plates are to be overlapped and double riveted to the floor plates and further attached by brackets of the same thickness and breadth as the web, double riveted to both the floor and the web. The inner edges of the brackets are to be stiffened by angle bars, or the plates may be flanged. The web plates are to be attached at the head, either by a double riveted lap and bracket to the strong beams crossing the trunk at the tank deck, or by double angles to a shelf plate fitted at the same height. The inner edges of the web plates are to be stiffened by angle bars, or the plates may be flanged. The webs are to be connected to the bulkheads by single attachment angles.

6. Where the vertical stiffeners and webs are fitted extending continuously from the keel to the top of the expansion trunk, the **shelf plate** at tank deck may be dispensed with on that side of the bulkhead.

7. **Horizontal girders** in number and dimensions as given in **Table 35** are to be fitted in line with the horizontal girders on the transverse bulkheads. Where plate girders

are fitted they are to be attached to the middle line bulkheads by single attachment angles. The ends of the girders are to be attached to the transverse bulkheads by brackets of the thickness of the side stringer plates extending fore and aft and athwartships for a distance of two frame spaces as shown in **Sketch** on page 150. The brackets are to be connected to the girders on one side of the transverse bulkhead by double riveted overlaps, and on the opposite side to the bulkhead plating by double attachment angles, or large single angle double riveted. The inner edges of the brackets are to be stiffened by angle bars or the bracket plates may be flanged.

8. The vertical web plates and horizontal girders are to be supported by **brackets** to prevent them from tripping.

9. In the **expansion trunk** the middle line bulkhead is to be stiffened by vertical angles as required by **Table 35** spaced the same as the frames and bracketed at head and heel, and by web plates fitted in line with those below.

BEAMS.

Section 61. 1. The **deck beams** are to be fitted at every frame at tank deck and decks above, also at top of expansion trunk. Their scantlings are to be regulated by the requirements of **Table 11.**

2. "**Strong**" **beams** of the dimensions required by **Table 12** for "strong" hold beams, or equivalent thereto, are to be fitted at the heads of all web frames in the oil compartments extending from the middle line bulkhead to the sides of the vessel.

3. The strong beams are to be overlapped and well riveted to the web frames at the sides of the vessel, and the two are to be additionally connected by **brackets** of the same thickness as the web frames, the inner edges of the brackets being stiffened by angle bars, or the plates may be flanged. The breadth and depth of these knees are to be equal to the depth of the web frame, and they are to be measured from the lower edge of the beam and the inner edge of the web frame. The knees are to be double riveted in each arm.

4. The strong beams are to be connected to the middle line bulkhead by **brackets** similar to those at the sides of the vessel. On the one side of the bulkhead the brackets are to be connected to the vertical web plates by double riveted overlaps, and on the opposite side to the bulkhead plating by double attachment angles. The inner edges of the brackets are to be stiffened by angle bars, or the bracket plates may be flanged.

5. Where it may be desired to dispense with any of the strong beams in way of the expansion trunk on account of their interfering with the arrangement of hatchways leading to the oil compartments, plans showing the arrangements proposed with a view to providing equivalent strength are to be submitted for approval.

6. **Shelf Plates.**—One beam on each side of the transverse bulkheads is to be extended to the middle line bulkhead and to be attached thereto in the same way as at the sides of the vessel. The spaces between the transverse bulkheads and these adjacent beams are to be plated over in the expansion trunk.

7. The remainder of the beams are to extend within the sides of the expansion trunk sufficiently to admit of their ends being connected to the vertical stiffeners on the sides of the trunk by means of **bracket plates** of a breadth and depth equal to three times the depth of the beam. Any other efficient arrangement for obtaining the attachment at this part may be submitted for approval.

8. The beams of **decks above the tank deck** are to be cut at the sides of the expansion trunk and connected to the same by bracket plates, of the dimensions of beam knee brackets, and single attachment angles.

9. The beams at the **top of expansion trunks** are to be of upper deck size, efficiently bracketed at their ends to the sides of the expansion trunk and middle line bulkhead with plates of the dimensions of beam knee brackets.

PILLARS.

Section 62. 1. **Quarter pillars** formed of double channel bars of the dimensions required by **Table 15** are to be fitted at each strong beam in the oil compartment. The quarter pillars are to be fitted practically in line with the sides of the continuous expansion trunk.

2. Where the **trunk is not continuous,** girders of the dimensions required by **Table 16** are to be fitted under the tank deck at the heads of the pillars. Intercostal girders are also to be fitted to the decks above.

3. The pillars are to be attached at their heads to the beams or girders by large **gusset plates**; the lower ends of the pillars are to extend down and be well riveted to the floor plates and further attached by transverse gusset plates, double riveted, to the upper edges of the floors. The gusset plates are to be of the same thickness as the floor plates, their depth three times and their breadth five times the breadth of the channel bars.

OUTSIDE PLATING.

Section 63. 1. The **thickness** of the outside plating is to be as required by **Tables 17** and **18.**

2. The **butts** of outside plating are, so far as practicable, to be kept clear of the frame spaces adjacent to the oil tight bulkheads, and the plate edges are not to be joggled.

DECK PLATING AND STRINGERS.

Section 64. 1. The **decks** of vessels intended to carry oil in bulk are to be of steel of not less **thickness** than required by **Tables 17** and **18,** and in no case less than ·30 of an inch. The thickness of tank deck plating and top of expansion trunk is not to be less than required by the following Table :—

Longitudinal Number.	Minimum thickness.
	inches.
Under 16,400	·30
16,400 and under 20,100	·32
20,100 „ „ 24,300	·34
24,300 „ „ 27,100	·36
27,100 „ „ 29,900	·38
29,900 „ „ 39,700	·40
39,700 „ „ 43,900	·42
43,900 „ „ 48,100	·44
48,100 „ „ 50,000	·46

2. The steel deck forming the top of the oil tanks is to be fitted continuously over the oil compartments and through the cofferdams.

3. The **stringer angles** at tank decks are to be of the dimensions given for flat keel angles in **Table 34,** but in no case less than required by **Table 18.**

4. **Shelf plates,** one frame space in breadth and of the thickness of the tank deck plating, are to be fitted inside the expansion trunks along each side of the middle line and transverse bulkheads at the height of the tank deck, and additional cross tie plating supported by beams is to be fitted to the satisfaction of the Committee. A single angle of the size required for lower deck stringer angles is to be fitted along the inner edges of the shelf plates on the middle line bulkhead or the plates may be flanged.

5. All **hatchways and deck openings** are to have rounded corners and the deck plating is to be increased in thickness in way of the openings.

EXPANSION TRUNKS.

Section 65. 1. The plating forming the sides of the **expansion trunks** is to be of the thickness required by **Table 36.** It is to be stiffened by vertical angles, spaced the same as the frames, fitted inside the trunk and bracketed to the beams at head and heel. Vertical web plates, flanged on the inner edges and attached to the trunk plating by single attachment angles, are to be fitted opposite the web frames at the sides of the vessel. The vertical stiffeners and web plates are to be of the dimensions given in **Table 36.**

2. The side plating of the trunks is to be attached to the tank deck plating by single angles having flanges of the breadth required for the tank deck stringer angles and ·06 of an inch less in thickness. The trunk side plating is to be attached to the upper deck plating, or top of expansion trunk, by single attachment angles.

3. Where expansion trunks are continuous, the sides of the same are to be carried through all cofferdams except the forward one, and also through the after one when the engines are fitted amidships.

4. Where the expansion trunks are not continuous, the plating and stiffening of the ends of the **short trunks** are to be at the sides as required by **Table 36** and the corners of the trunks are to be of rounded form.

5. **Small hatchways** in the top of expansion trunks are to be fitted with hinged plate covers capable of being made oil tight. A 6 inch screw plug is to be fitted in the cover to each tank, also a gas cock to admit of the release of gas from the tanks without opening the covers.

6. Where **large cargo hatchways** are fitted in the top of expansion trunks, sketches of the oil tight covers proposed to be fitted, also of the arrangements of strong beams and cross tie plating at the tank deck in way of the hatchways, are to be submitted for approval.

SUMMER TANKS.

Section 66. In cases where "**summer tanks**" are fitted in the 'tween decks they are to be constructed and tested as required for the ordinary oil compartments and efficient arrangements are to be made for the expansion of the oil.

ENGINE AND BOILER SPACE.

Section 67. 1. The **scantlings and arrangements** of web frames and side stringers in the machinery space are to be similar to those in the oil compartments.

2. The **sides of continuous expansion trunks** are to be carried through the machinery space to form the casings of the engine and boiler openings; or to be efficiently overlapped with the same. The coaming plates of the casings are to extend below the deck at least twice the depth of the strong beams and to be fitted with double angles at the lower edge. They are to be incorporated with the deep web plates or large brackets at the bulkheads. The through beams in the machinery space are to be cut at the coamings and attached to the same by gusset plates and brackets.

3. Where a **double bottom** is fitted in the machinery space, care is to be taken to provide against an abrupt termination of the longitudinal strength at the bulkheads, by the fitting of webs, or large brackets, in way of the keelsons.

TUNNEL.

Section 68. 1. When engines are situated amidships, a **shaft tunnel** is to be fitted through the after oil compartments. It is to be entirely separated from the engine room by means of a cofferdam.

2. There is to be a **trunkway** at each end, leading from the upper deck to the tunnel, to afford means of readily entering and leaving the same. The trunkway at the forward end is to be abaft the cofferdam.

3. **Construction.**—The tunnel is to be circular in form and constructed of plating ·06 of an inch thicker than required by **Table 33** for floor plates amidships. It is to be attached to the middle line bulkhead above and below and to the transverse bulkheads by double angles of the size required for the angles attaching middle line and transverse bulkheads (**Section 60, paragraph 2**). A stiffening angle of the size required for flat keel angles is to be fitted round the outside of the tunnel in way of each web plate on middle line bulkhead. These angles are to be efficiently bracketed to the middle line bulkhead at upper part of tunnel and to the middle line bulkhead and floors at lower part. Efficient plate bearers are also to be fitted under the tunnel in way of the tunnel stools. Where horizontal girders on the transverse bulkheads are cut by the tunnel, their ends are to be connected to the tunnel plating by large plate brackets as to the middle line bulkhead.

RIVETING.

Section 69. 1. The **riveting** is to be of the most efficient character and the points of the rivets left full or convex. Special care is to be taken in the punching and countersinking of the holes and the fitting together of the various parts. Where any unfairness exists in the holes they are to be rimered, not drifted, and larger rivets used in the rimered holes. The "burr" caused by punching, and all drillings and rimerings must be removed before the different parts are screwed together for riveting. Where the heads of the rivets are not laid up close to the plating or angle bars, or where rivets when tested are found unsatisfactory they are to be removed, not caulked. All oil tight joints are to have the surfaces of steel plates fitted close to each other and caulked, without, as far as practicable, the use of canvas, &c.

2. The butts of **flat keel** plates are to be double strapped and treble riveted, the butts of the **vertical keel** plates over-lapped and treble riveted, and the flanges of the **flat keel angles** double riveted.

3. The seams and butts of the plating of the middle line and transverse **bulkheads** of the oil compartments, cofferdams and expansions trunks are to be double chain riveted; the flanges of single bulkhead frames and the transverse flange of the larger of the two bulkhead frames where doubles frames are fitted are also to be double riveted.

4. The **seams of outside plating** in way of the oil compartments are not to be less than double chain riveted with an additional pair of rivets in each frame space beyond the number required by **Table 20**. In vessels of 450 feet and under 475 feet in length three seams of outside plating on each side between the bilge and tank deck are to be treble riveted between the peak bulkheads, in vessels of 475 feet and under 500 feet four seams, and in vessels 500 feet to 550 feet all the seams from the bilge to the tank deck are to be treble riveted.

5. The **butts of outside plating** in way of the oil compartments are not to be less than treble riveted and are to be either overlapped or double strapped. Double straps are to be fitted to the butts of the strake of outside plating in way of the deck forming the top of the tank, and all vessels of 380 feet and above in length are to have double straps fitted to the butts of the sheerstrake. In vessels of 380 feet and under 400 feet in length double straps are to be fitted to the butts of the plating forming the flat of the

bottom, in vessels of 400 feet and under 450 feet double straps are to be fitted to the butts of the bottom and bilge plating, and in vessels of 450 feet to 550 feet in length double straps are to be fitted to the butts of all outside plating for three-fourths the vessel's length amidships.

6. The **butts of the deck stringer plates** are to be not less than treble riveted and must be overlapped or double strapped. Where the stringer plates are ·60 of an inch and above in thickness double straps are to be fitted to the butts. The flanges of the deck stringer angles and the angles attaching the sides of the expansion trunk to the tank deck are to be double riveted.

7. The **seams and butts** of the **deck plating** forming the top of the oil compartments are not to be less than double chain riveted. When the deck plating is ·46 of an inch or more in thickness the butts of the same are to be treble riveted.

8. The seams and butts of the plating forming sides and top of **expansion trunk** are to be not less than double chain riveted.

9. The seams and butts of **tunnel plating** are to be double chain riveted, and the flanges of the tunnel stiffeners double riveted to the tunnel plating, web plates and brackets.

10. **Spacing of rivets.**—The rivets in the various parts are to be spaced as follows, viz. :—

$3\frac{1}{2}$ diam. C. to C.	In butts of flat and vertical keel plates, butts of all outside plating and deck stringer plates, seams and butts of tank deck plating and middle line and transverse bulkheads, sides and top of expansion trunk and tunnel plating.
4 diam. C. to C.	In flat keel angles, boundary bars of bulkheads, tank deck stringer angles and angles at upper and lower corners of expansion trunks.
5 diam. C. to C.	In bracket knee plate attachments to floor plates, side stringers and bulkhead stiffeners.
6 diam. C. to C.	In frames, reversed frames, floors, keelsons, face angles on web frames and side stringers, bulkhead stiffeners, web plates and girders, expansion trunk stiffeners, tunnel stiffeners and deck plating and top of expansion trunk to beams.

11. Wherever the frames, beams or stiffeners to bulkheads and expansion trunks cross the seams or butts of the plating, two rivets are to be fitted through the plating and bars.

12. **Attachment Angles.** The breadths of the flanges of attachment angles are to be as follows :—

for $\frac{5}{8}$ inch and $\frac{3}{4}$ inch rivets ... 3 inches.
for $\frac{7}{8}$ inch rivets... ... ... $3\frac{1}{2}$ „
for 1 inch rivets... ... ... 4 „

the angles are to be of the mean thickness of the plates they attach.

PUMPING ARRANGEMENTS.

Section 70. 1. **Oil pumps** fitted for the purpose of filling or discharging the oil compartments are to be kept entirely separate from the pumps fitted for filling or clearing the water ballast compartments of water.

2. The **water ballast pipes** are not to pass through the oil compartments, nor the pipes for the oil through any water ballast spaces. A **separate ballast pump** is to be fitted forward of the oil compartments for the purpose of filling and clearing the forward ballast tanks.

3. Oil **pump rooms** are to be enclosed by watertight bulkheads and have no direct communication with the machinery space.

4. The **limber holes** in the floors and intercostals in the oil compartments are to be so arranged in the vicinity of the pumps as to admit of a sufficient flow of oil to the pump suctions.

5. Efficient arrangements are to be provided for clearing the **tunnel and 'tween deck spaces** of water.

6. **Sounding pipes** are to be fitted in the cofferdams.

VENTILATION.

Section 71. 1. It is of the greatest importance in oil carrying vessels that the internal arrangements should be such that the compartments can be readily cleared of gas, and efficient means are to be provided for **clearing the dangerous gases** from the tanks by the injection of steam or by the adoption of some efficient system of artificial ventilation.

2. **Ventilators** are to be fitted to the pump rooms, cofferdams, 'tween decks, deck erections and other enclosed spaces, to allow of the free escape of all gases from these parts.

3. The **tunnel** is to be efficiently ventilated by large ventilators placed on the upper part of the trunks at the ends of the tunnel.

ELECTRIC LIGHTING.

Section 72. 1. The single wire system must not be adopted for any part of the insulation in vessels carrying petroleum.

2. Switches and cut-outs must not be fitted in places liable to the accumulation of petroleum vapour or gas, and all lamps in places where it is possible for gas to accumulate must be made with an outer glass globe made airtight. All wires in such places are to be lead covered, or the insulation of the cables employed is to be of such a nature as not to be affected by petroleum.

3. No joints of cables, switches, or cut-outs, should be fitted in the pump rooms, but the wires for each lamp therein should be carried to the lamp from a distributing junction box placed outside the pump room or companion.

PERIODICAL SURVEYS.

Section 73. 1. **Preparation of Tanks.**—When vessels classed for carrying oil in bulk are undergoing special survey, the tanks are to be cleaned out and thoroughly cleared of gas to admit of their being properly examined, and every precaution is to be taken to ensure safety during inspection.

2. **Testing.**—Each oil compartment and cofferdam is to be tested by being filled with water to the top of the hatchway in the expansion trunk or cofferdam.

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, Fenchurch Street, London, E.C.

16*th June*, 1910.

RULES

FOR THE

SURVEY AND CONSTRUCTION OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 1. In steam vessels, the machinery and boilers are to be inspected throughout construction, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them in the manner shown in form No. 4. If found satisfactory, the Committee will thereupon grant a certificate, and insert in the Register Book the notification, "LMC" *in red* (*i.e.* "LLOYD'S MACHINERY CERTIFICATE"), indicating that the machinery and boilers are certified to be in good order and safe working condition.

SPECIAL SURVEY OF NEW ENGINES OR BOILERS.

Section 2. 1. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

2. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✢ will be noted in red, thus : "✢LMC," or "✢NE & B," or "✢NB."

3. In order to facilitate this inspection, the plans of the machinery and boilers are to be examined, and from them the working pressure fixed.

4. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam ; any defects, &c., to be pointed out as early as possible.

5. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

BOILERS.

Section 3. 1. The Surveyors will be guided in fixing the working pressure by the tables and formulæ annexed. (*See* Section 11.)

2. Any novelty in the construction of the machinery or boilers to be reported to the Committee.

3. The boilers, together with the machinery, to be inspected at different stages of construction.

All the holes in steel boilers should be drilled, but if they be punched the plates are to be afterwards annealed.

All plates that are dished or flanged, or in any way heated in the fire for working, except those that are subjected to a compressive stress only, are to be annealed after the operations are completed.

No steel stays are to be welded.

Unless otherwise specified, the Rules for the construction of iron boilers will apply equally to boilers made of steel.

4. The boilers to be tested by hydraulic pressure, in the presence of the Engineer-Surveyor, to twice the working pressure, and carefully gauged while under test.

5. Two safety valves to be fitted to each boiler, and loaded to the working pressure in the presence of the Surveyor. In the case of boilers of greater working pressure than 60 lbs. per square inch, the safety valves may be loaded to 5 lbs. above the working pressure. If common valves are used their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used they are to be tested under steam in the presence of the Surveyor; the accumulation in no case to exceed 10 per cent. of the working pressure.

6. An approved safety valve also to be fitted to the super-heater.

7. In winch boilers one safety valve will be allowed, provided its area be not less than half a square inch per square foot of grate surface.

8. Each valve to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety-valve spindles to extend through the covers and be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats, and their efficiency tested at any time.

9. Stop-valves to be fitted so that each boiler can be worked separately.

10. Each boiler to be fitted with a separate steam gauge, to accurately indicate the pressure.

11. Each boiler to be fitted with a blow-off cock independent of that on the vessel's outside plating.

12. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyor.

QUALITY AND TESTING OF BOILER STEEL.

Section 4. 1. When steel is used in the construction of boilers intended for vessels classed or proposed for classification in the Society's Register Book, the boilers shall be constructed in accordance with the requirements of the Rules, and the following conditions be fulfilled :—

2. **Process of Manufacture.**—Steel for Marine Boilers shall be made by the Open Hearth process, acid or basic.

3. **Freedom from Defects.**—The finished material shall be free from cracks, surface flaws, and lamination. It shall also have a workmanlike finish, and must not have been hammer-dressed.

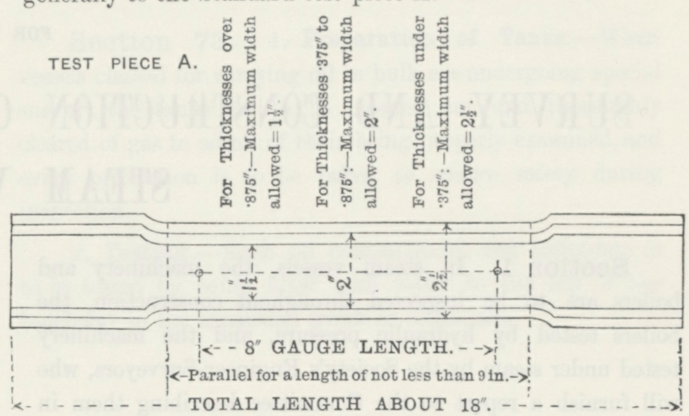
4. **Testing and Inspection.**—The following tests and inspections shall be made at the place of manufacture prior to despatch ; but, in the event of any of the material proving unsatisfactory in the course of being worked into boilers, such material shall be rejected, notwithstanding any previous certificate of satisfactory testing, and such further tests of the material from the same charge may be made as the Surveyor may consider desirable.

5. **Tensile Test Pieces.**—The tensile strength and ductility shall be determined from Standard test pieces cut lengthwise or crosswise from the rolled material. When material is annealed or otherwise treated before despatch, the test pieces shall be similarly and simultaneously treated with the material before testing.

Plates, Angles, and Tee Bars :—Wherever practicable the rolled surfaces shall be retained on two opposite sides of the test piece. The elongation shall be measured on a Standard test piece having a gauge length of 8 inches.

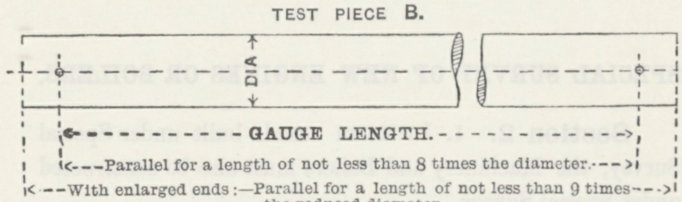
For material more than ·875 in. in thickness the width of the test piece between the gauge points shall not exceed $1\frac{1}{2}$ ins. ; for material ·875 in. to ·375 in. in thickness, inclusive, the width shall not exceed 2 ins. ; for material less than ·375 in. in thickness the width shall not be more than $2\frac{1}{2}$ ins. In other respects the test pieces shall conform generally to the Standard test piece A.

TEST PIECE A.



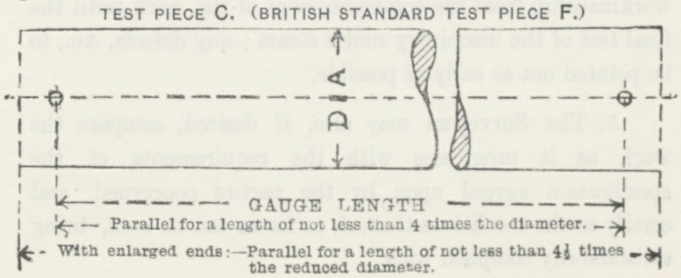
Round Bars :—Round bars may be tested either full size as rolled, or turned down when the diameter is considerable. The test piece shall have a gauge length of not less than 8 times its diameter, and a sectional area of not less than $\frac{1}{4}$ square inch. When enlarged ends are used the length of the parallel portion shall not be less than 9 times the reduced diameter, *see* Standard test piece B.

TEST PIECE B.



Where bars are above one inch diameter, and are tested full size as rolled, or have been turned down and the resulting test piece is above one inch diameter, a gauge length of 4 times the diameter may be used if preferred by the Manufacturer, in which case an increased elongation will be required, as specified in paragraph 7. When enlarged ends are used, the length of the parallel portion shall be not less than $4\frac{1}{2}$ times the reduced diameter, *see* Standard test piece C.

TEST PIECE C. (BRITISH STANDARD TEST PIECE F.)



Any straightening of test pieces which may be required shall be done cold.

6. **Mechanical Tests and Selection of Test Pieces.**— Plates and bars for boilers shall comply with the following mechanical tests. All test pieces shall be selected by the Surveyor and tested in his presence, and he shall satisfy himself that the conditions herein described are fulfilled.

7. **Tensile Tests.** Plates :—The tensile breaking strength of steel plates for shells and girders, determined from Standard test pieces, shall be between the limits of 28 and 32 tons per square inch. For plates intended for flanging or welding, and for combustion chambers and furnaces, the tensile breaking strength shall be between the limits of 26 and 30 tons per square inch. In the case of material for purposes in which tensile strength is not important, the tensile test may be dispensed with and the bend test only be made, if so specified by the builders and approved by the Committee. The elongation, measured on a Standard test piece having a gauge length of 8 ins., shall not be less than 20 per cent. for material of ·375 in. in thickness and upwards required to have a tensile breaking strength of 28 to 32 tons per square inch ; and not less than 23 per cent. for material of ·375 in. in thickness and upwards required to have a tensile breaking strength of 26 to 30 tons per square inch.

Stay, Angle and Tee Bars :—The tensile breaking-strength of longitudinal stays and angle and tee bars shall be between the limits of 28 and 32 tons per square inch, with an elongation of not less than 20 per cent. of the gauge length measured on the Standard test piece A or B, or 24 per cent. measured on the Standard test piece C. For bars for combustion chamber stays the tensile breaking strength shall be between 26 and 30 tons per square inch, with an elongation of not less than 23 per cent. of the gauge length measured on the Standard test piece B, or 28 per cent. measured on the Standard test piece C.

For material under ·375 in. in thickness the elongation may be not more than 3 per cent. below the above-named elongations.

Rivet Bars :—The tensile breaking strength of rivet bars shall be between the limits of 26 and 30 tons per square inch of section, with an elongation of not less than 25 per cent. of the gauge length measured on the Standard test piece B, or 30 per cent. measured on the Standard test piece C. The bars may be tested the full size as rolled.

8. **Number of Tensile Tests.** Plates.—One tensile test shall be taken from each plate as rolled. For plates exceeding $2\frac{1}{2}$ tons in weight one tensile test shall be taken from each end.

Angle, Tee, Rivet and Stay Bars :—At least two tensile tests for angle bars, tee bars, rivet bars, and stay bars shall be taken from each charge ; but when the number of the bars, as rolled, from one charge exceeds 15, an additional tensile test shall be made for each further batch of 15 bars or portion thereof. In round bars of $1\frac{3}{4}$ inch diameter and under, the number shall be 50 in place of 15.

Should a tensile test piece break outside the middle half of its gauge length, and the elongation be less than that required by the Rules the test may, at the Maker's option, be discarded and another test be made of the same plate or bar.

9. **Bend Tests.** Cold Bends :—Test pieces shall be sheared lengthwise or crosswise from plates or bars, and shall not be less than $1\frac{1}{2}$ ins. wide, but for small bars the whole section may be used. For rivet bars bend tests are not required.

Temper Bends :—The test pieces shall be similar to those used for cold bend tests. For temper bend tests the samples shall be heated to a blood red and quenched in water at a temperature not exceeding 80 degrees Fahr. The colour shall be judged indoors in the shade.

In all cold bend tests, and in temper bend tests on samples ·5 in. in thickness and above, the rough edge or arris caused by shearing may be removed by filing or grinding, and samples 1 in. in thickness and above may have the edges machined, but the test pieces shall receive no other preparation. The test pieces shall not be annealed unless the material from which they are cut is similarly annealed, in which case the test pieces shall be similarly and simultaneously treated with the material before testing.

For both cold and temper bends the test piece shall withstand, without fracture, being doubled over until the internal radius is equal to $1\frac{1}{2}$ times the thickness of the test piece, and the sides are parallel.

For small sectional material these bend tests may be made from the flattened bar.

Bend tests may be made either by pressure or by blows.

10. **Number of Bend Tests.** Plates :—One cold or temper bend test shall be taken from each plate as rolled. For plates exceeding $2\frac{1}{2}$ tons in weight one bend test shall be taken from each end—one bend test to be temper and the other cold.

Angle Bars :—A cold or a temper bend test shall be made from each angle bar rolled.

Stay Bars :—A cold and temper bend test shall be made from every 15 stay bars as rolled from each charge.

11. **Tests for Manufactured Rivets.**—Rivets selected by the Surveyor from the bulk shall withstand the following tests :—

(*a*) The rivet shanks are to be bent cold, and hammered until the two parts of the shank touch in the manner shown in Fig. 1, without fracture on the outside of the bend.

(*b*) The rivet heads are to be flattened, while hot, in the manner shown in Fig. 2, without cracking at the edges. The heads are to be flattened until their diameter is $2\frac{1}{2}$ times the diameter of the shank.

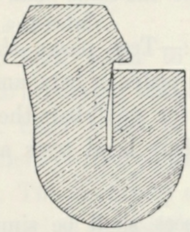


Fig. 1.

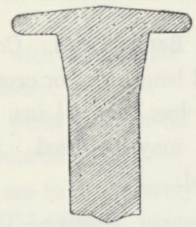
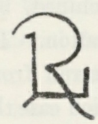


Fig. 2.

12. **Additional Tests before Rejection.**—Should any of the test pieces first selected by the Surveyor not fulfil the test requirements, two further tests may be made from the same plate or bar, but should either of these fail, the plate or bar from which the test pieces were cut shall be rejected. In all such cases further tests shall be made before any material from the same charge can be accepted.

13. **Branding.**—Every plate and bar shall be clearly and distinctly marked by the Maker in two places with the Society's brand, thus :—



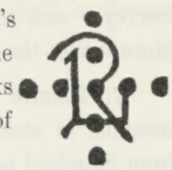
indicating that the material has complied with the Society's tests.

No plates or bars bearing this brand shall be forwarded from the Steel Works until the prescribed tests have been made by the Surveyor, and the mill sheets have been signed by him. All plates and bars shall also be legibly stamped in two places with the Maker's name or trade mark, and the place where made. They shall also be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

14. **Maker's Certificate.**—Before the mill sheets are signed by the Surveyor, the Maker shall furnish him with a certificate guaranteeing that the material has been made by the Open Hearth process, and that it has been subjected to, and has withstood satisfactorily, the tests above described in the presence of the Surveyor. The following form of certificate will be accepted if printed on each mill sheet with the name of the firm, and initialled by the Test House Manager :—

"We hereby certify that the material described below has been made by the Open Hearth process, and is that which has been satisfactorily tested in the presence of the Surveyor in accordance with the Rules of Lloyd's Register."

15. **Defacing of Rejected Material.**—In the event of the material failing, in any case, to withstand the prescribed tests, the Surveyor shall see that the Society's brand stamped on the plates and bars by the Maker has been defaced by punch marks extending beyond the brand in the form of a cross, thus :—



denoting that the material has been rejected.

16. **Facilities for Inspection.**—The Maker shall adopt a system of marking the ingots, billets, slabs, plates, bars, &c., which will enable all finished material to be traced to the original charge, and the Surveyor must be given every facility for tracing all plates and bars to their respective charges, and for witnessing the required tests. When he is satisfied with the material and with the results of the tests, he shall be furnished with two copies of the advice notes of the material for his signature, one of which is to be forwarded by the manufacturer to the Boiler Maker, and the other is to be forwarded by the Surveyor to the Surveyors at the port where the boiler is to be built.

17. **Steel not produced where Rolled.**—Where steel is not produced in the works at which it is rolled, a certificate shall be supplied to the Surveyor, stating the Open Hearth process by which it was made, the name of the Steel Maker who supplied it, also the numbers of the charges for reference to the books of the Steel Maker. The number of the charge shall be marked on each ingot or billet for the purpose of identification, and the finished plates and bars shall also be legibly stamped in two places with the Maker's name or trade mark, and the place where made. They shall also be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

18. **General.**—Besides the foregoing tests, samples of all material may be subjected to additional tests at the discretion of the Surveyors.

19. In cases wherein it may be desired by Owners and Builders, consideration will be given by the Committee to proposals for the use of steel of other tenacity than is provided for in the foregoing Rules.

QUALITY AND TESTING OF STEEL CASTINGS.

Section 5. 1. **Process of Manufacture.**—Steel for castings shall be made by the Open Hearth process, Acid or Basic, or by such other process as may be approved by the Committee.

2. **Annealing.**—All steel castings shall be thoroughly annealed in a properly constructed annealing furnace, which must permit of the whole casting being uniformly raised in temperature throughout its whole extent to the necessary intensity required for annealing purposes. The casting shall be allowed to cool down prior to removal from the annealing furnace; and if subsequently heated for any purpose it shall again be similarly annealed if required by the Surveyor.

3. **Testing and Inspection.**—The following tests and inspections shall be made, preferably at the place of manufacture prior to despatch, but in the event of any casting proving unsatisfactory in the course of preparation or erection, such casting shall be rejected notwithstanding any previous certificate of satisfactory testing.

4. **Tensile and Bend Test Pieces.**—The tensile strength and ductility shall be determined from standard test pieces, which are to be prepared from sample pieces cast on the casting. These sample pieces are not to be cut or partially cut from the castings until the annealing of such castings has been completed, nor until they have been stamped by the Surveyor. The test pieces are to be stamped by the Surveyor after the annealing. All test pieces shall be selected by the Surveyor and tested in his presence, and he shall satisfy himself that the conditions herein described are fulfilled.

5. **Number of Tests.**—At least one tensile test and one cold bend test are to be taken from each casting. In castings of complex design, referred to in paragraph 12, at least two tensile and two cold bend tests are to be taken. Where a casting is made from more than one charge of steel, at least four tensile and four cold bend tests are to be taken from pieces cast as far apart as possible on the casting, some test pieces being taken from as near the top, and others from as near the bottom of the casting as practicable.

6. **Dimensions of Tensile Test Pieces.**—The tensile test pieces are to be turned so as to have a diameter of ·564 inch with a gauge length of 2 inches, or a diameter of ·798 inch with a gauge length of 3 inches, or a diameter of ·977 inch with a gauge length of $3\frac{1}{2}$ inches.

7. **Dimensions of Bend Test Pieces.**—The bend test pieces are to be machined to a rectangular section 1 inch wide by $\frac{3}{4}$ inch thick, with the edges rounded to a radius of $\frac{1}{16}$th of an inch. They are to be bent over the thinner section. The bending may be performed either by pressure or by blows.

8. **Tensile Tests.**—The tensile breaking strength determined from test pieces of standard dimensions is to be between the limits of 26 and 35 tons per square inch with an elongation of not less than 20 per cent. measured on the standard test piece.

9. **Bend Tests.**—The bend test pieces must withstand without fracture being bent cold through an angle of 120 degrees, the internal radius of the bend being not greater than one inch.

10. **Additional Tests before Rejection.**—Should either the tensile or bend test or both fail and the Surveyor consider the fractured test piece or test pieces, or the results obtained therefrom, do not fairly represent the quality of the casting, a duplicate of the test or tests which failed shall be made if requested by the Maker. In such cases the quality of the casting shall be judged by the result of the duplicate test or tests and not by the original test or tests which failed.

11. **Percussive Tests.**—The castings are to be dropped on hard ground from a height of from 7 to 10 feet, according to the design, shape, and weight of the casting.

12. **Castings of Complex Design.**—Castings of complex design which would be liable to be deformed if submitted to the drop or percussive test, may have this test dispensed with provided two tensile and two cold bend tests be made upon pieces taken from positions as far apart as possible on each casting; one tensile and one bend test being taken from as near the top and the others from as near the bottom of the casting as practicable.

13. **Hammering Tests.**—After being subjected to the percussive test, the casting in each case is to be subsequently slung up and well hammered with a sledge hammer not less in weight than 7 lbs., to satisfy the Surveyors that the casting is sound and without flaw. This hammering test is also to be applied to castings of complex design which may not have been submitted to a percussive test.

14. When the castings are to be used for purposes for which cast iron is ordinarily employed they need not be submitted to tensile and bend tests, but they must be submitted to the drop and hammering tests specified in paragraphs 11 and 13.

15. **Branding.**—Every casting after it has satisfactorily withstood the prescribed tests, shall be clearly and distinctly marked by the Society's Surveyor indicating that the casting has complied with the Society's requirements.

QUALITY AND TESTING OF INGOT STEEL FORGINGS.

Section 6. 1. **Process of Manufacture.**—Ingot steel for forgings shall be made by the Open Hearth process, Acid or Basic, or by such other process as may be approved by the Committee.

The forgings must be sound, they are to be made from sound ingots, and for all important forgings such as crank and propeller shafts, connecting rods, piston rods, the forgings must be gradually and uniformly forged. The sectional area of the body of the forging (as forged) shall not exceed one-fifth of the sectional area of the original ingot, and no part of the forging (as forged) shall have more than two-thirds of the sectional area of the original ingot.

2. **Annealing.**—All important ingot steel forgings shall be thoroughly annealed in a properly constructed annealing furnace, which must permit of the whole forging being uniformly raised in temperature throughout its whole extent to the necessary intensity required for annealing purposes. If the forging be subsequently heated for any further forging it shall again be similarly annealed, if required by the Surveyor.

3. **Testing and Inspection.**—The following tests and inspections shall be made, preferably at the place of manufacture prior to despatch, but in the event of any forging proving unsatisfactory in the course of preparation or erection, such forging shall be rejected notwithstanding any previous certificate of satisfactory testing.

4. **Tensile and Bend Test Pieces.**—The tensile strength and ductility shall be determined from standard test pieces which are to be prepared from sample pieces cut lengthwise from the forging from a part of not less sectional dimensions than the body of the forging. Such standard test pieces shall be machined from the sample pieces without forging down, and the sample pieces shall not be detached from the forging until the annealing of such forging has been completed. The test pieces are to be stamped by the Surveyor after the annealing. All test pieces shall be selected by the Surveyor and tested in his presence, and he shall satisfy himself that the conditions herein described are fulfilled.

5. **Number of Tests.**—At least one tensile and one cold bend test are to be taken from each forging. Where a number of articles are cut from one forging, one tensile and one cold bend test from this whole forging will be sufficient.

6. **Dimensions of Tensile Test Pieces.**—The tensile test pieces are to be turned so as to have a diameter of ·564 inch with a gauge length of 2 inches, or a diameter of ·798 inch with a gauge length of 3 inches, or a diameter of ·977 inch with a gauge length of $3\frac{1}{2}$ inches.

7. **Dimensions of Bend Test Pieces.**—The bend test pieces are to be machined to a rectangular section 1 inch wide by $\frac{3}{4}$ inch thick, with the edges rounded to a radius of $\frac{1}{16}$th of an inch. They are to be bent over the thinner section. The bending may be performed either by pressure or by blows.

8. **Tensile Tests.**—The tensile breaking strength determined from test pieces of standard dimensions is to be between the limits of 28 and 32 tons per square inch with an elongation on the standard test piece of not less than 29 per cent. for 28 ton steel, and 25 per cent. for 32 ton steel, and in no case must the sum of the tensile breaking strength and corresponding elongation be less than 57.

9. **Bend Tests.**—The bend test pieces must withstand without fracture being bent cold through an angle of 180 degrees, the internal radius of the bend being not greater than $\frac{1}{4}$ inch.

10. **Additional Tests before Rejection.**—Should either the tensile or bend test, or both, fail, and the Surveyor consider the fractured test piece or test pieces, or the results obtained therefrom, do not fairly represent the quality of the forging, a duplicate of the test or tests which failed shall be made if requested by the maker. In such cases the quality of the forging shall be judged by the result of the duplicate test or tests and not by the original test or tests which failed.

11. **Branding.**—Every forging after it has satisfactorily withstood the prescribed tests, shall be clearly and distinctly marked by the Society's Surveyor indicating that the forging has complied with the Society's requirements.

12. **General.**—The requirements as to annealing and testing are intended to apply to shafts of all descriptions, also to connecting rods and piston rods which require to be made in several heats. They are not intended to apply to small forgings which during their last stage of manufacture are uniformly heated throughout.

ENGINES.

Section 7. 1. The engines are to be fitted with two feed-pumps, each capable of supplying the boilers; the pumps, etc., to be so arranged that either can be overhauled whilst the other is at work.

2. The engines are to be fitted with two bilge pumps, which are to be so arranged that either can be overhauled whilst the other is at work.

3. In engines of 70 H.P. and under, and in engines of steam fishing vessels, one feed pump and one bilge pump will be deemed sufficient, provided they are of adequate capacity.

The main feed pumps may be worked by independent engines provided they are fitted with automatic regulators

for controlling their speed. If only one such pump is fitted for the main feed, the auxiliary feed pump required by paragraph 6 should also be fitted with an automatic speed regulator.

4. A bilge injection, or a bilge suction to the circulating pump, is to be fitted.

5. The engine bilge pumps are to be fitted capable of pumping from each compartment of the vessel, the peaks excepted. All bilge suction pipes are to be fitted with strum boxes or strainers, so constructed that they can be cleared without breaking the joints of the suction pipes. The total area of the perforations in the strainers should be not less than double that of the cross section of the suction pipe. The mud boxes and roses in engine room are to be placed where they are easily accessible, and to the satisfaction of the Surveyor.

6. A steam pump is to be provided capable of supplying the boilers with water; this pump to be provided with suctions to the hotwell and also to the sea. A steam pump is to be so fitted as to pump from each compartment, to deliver water on deck, and if no hand pump is fitted in engine room it must be fitted to be worked by hand. In small vessels in which only one steam pump is fitted, it must comply with all the requirements.

7. In all steam pipes provision is to be made for expansion and contraction to take place without unduly straining the pipes, and all main steam pipes are to be tested by hydraulic pressure to twice the working pressure, in the presence of the Engineer Surveyor.

8. All discharge-pipes to be, if possible, carried above the deep load-line, and to have discharge valves fitted on the plating of the vessel in an accessible position.

9. No pipes are to be carried through the bunkers without being properly protected.

10. Bilge suction-pipes to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

Shafts.

Section 8. 1. All shafts are to be turned all over and are to be examined when rough turned and when finished. In the case of screw shafts scrap steel is not to be used, and in no case is a mixture of scrap iron and scrap steel to be employed. It is recommended that screw shafts be made of ingot steel or forged from blooms made from rolled iron bar of good fibrous quality.

2. Gauges of an approved description for testing the truth of the crank shafts are to be supplied with all new engines, and adjusted in the presence of the Surveyor.

3. The length of the stern bush is to be at least four diameters of the shaft. It is recommended that the shaft liner should be continuous the whole length of the stern tube, and that the after end should be tapered in thickness and made watertight in the propeller boss. If the liner is made in two pieces the joint should be burned. If the liner does not fit tightly at the part between the bearings in the stern tube, the space between the shaft and the liner should be charged or "forced" with a plastic material insoluble in water and non-corrosive. If two liners are used, it is recommended that they be tapered in thickness at the ends, and that the shaft should be lapped or protected between the liners. In this case, and also if no liners are used, the diameter of the shaft should be $\frac{21}{20}$ths of that required for a shaft with a continuous liner.

4. For dimensions of shafts, see the formula in Section 18.

Cocks, Pipes, and Sea Connections.

Section 9. 1. With a view to insuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, in all new vessels and vessels having *new engines or boilers*:—

2. All sea-cocks to be fitted on the plating of the vessel above the level of the stoke-hold and engine-room platforms, or attached to Kingston valves of a height sufficient to lift them up to the level of these platforms.

3. The bolts securing all cocks or sea connections to the plating of the vessel are to be tapped into the plating of the vessel or fitted with countersunk heads.

4. The blow-off cocks on the plating of the vessel are to be fitted with spigots passing through the plating, and a brass or gun-metal ring on the outside. The cocks are to be so constructed that the key or spanner can only be taken off when the cock is shut.

5. Cocks and valves connecting all suction pipes to be fixed above the stoke-hold and engine-room platforms.

6. The arrangements of pumps, bilge injections, suction and delivery pipes, is to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement to be reported to the Committee.

Spare Gear.

Section 10. The articles of spare gear mentioned in the following list will be required to be carried in all steam vessels classed in the Society's Register Book, viz. :—

- 2 connecting rod or piston rod top-end bolts and nuts.
- 2 connecting rod bottom-end bolts and nuts.
- 2 main bearing bolts.
- 1 set of coupling bolts.
- 1 set of feed and bilge pump valves.
- 1 set of piston springs (where common springs are used).
- A quantity of assorted bolts and nuts.
- Iron of various sizes.

In addition to the foregoing the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

- Crank shaft.
- Propeller shaft.
- Propeller, or a full set of blades.
- Stern bush, or lignum vitæ lining for bush.
- 1 pair of connecting rod brasses.
- 1 pair of cross head brasses.
- 1 set of link brasses.
- 1 eccentric strap complete.
- Air pump rod.
- Circulating pump rod.
- H. P. valve spindle.
- L. P. valve spindle.
- 1 set of check valves.
- 6 cylinder cover bolts.
- 6 junk ring bolts.
- 4 valve chest cover bolts.
- 2 dozen boiler tubes.
- 3 dozen condenser tubes.
- 1 cylinder escape valve and spring.
- 1 set of safety valve springs.

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

Cylindrical Shells of Iron Boilers.

Section 11. The strength of circular shells of iron boilers to be calculated from the strength of the longitudinal joints by the following formula :—

$$\frac{C \times T \times B}{D} = \text{working pressure.}$$

where C = co-efficient as per following table,
T = thickness of plate in inches,
D = mean diameter of shell in inches,
B = percentage of strength of joint found as follows—the least percentage to be taken.

For plate at joint $B = \frac{p - d}{p} \times 100.$

For rivets at joint $B = \frac{n \times a}{p \times T} \times 100$ with iron rivets in iron plates with punched holes.

$B = \frac{n \times a}{p \times T} \times 90$ with iron rivets in iron plates with drilled holes.

(In case of rivets being in double shear, 1·75*a* is to be used instead of *a*.)

where p = pitch of rivets.
d = diameter of rivets.
a = sectional area of rivets.
n = number of rows of rivets.

Mem.—In any case where the strength of the longitudinal joint is satisfactorily shown by experiment to be greater than given by this formula the actual strength may be taken in the calculation.

Table of Co-efficients.

IRON BOILERS.

Description of Longitudinal Joint.	For Plates ½-inch thick and under.	For Plates ¾-inch thick and above ½-inch.	For Plates above ¾-inch thick.
Lap Joint, Punched Holes ...	155	165	170
Lap Joint, Drilled Holes	170	180	190
Double Butt Strap Joint, Punched Holes	170	180	190
Double Butt Strap Joint, Drilled Holes	180	190	200

Note.—The inside butt strap to be at least ¾ of the strength of the longitudinal joint.

Cylindrical Shells of Steel Boilers.

Section 12. The strength of cylindrical shells of steel boilers is to be calculated from the following formula :—

$$\frac{C \times (T - 2) \times B}{D} =$$

working pressure in lbs. per square inch.

where D = mean diameter of shell in inches.

T = thickness of plate in sixteenths of an inch.

C = 22 when the longitudinal seams are fitted with double butt straps of equal width.

C = 21·25 when they are fitted with double butt straps of unequal width, only covering on one side the reduced section of plate at the outer lines of rivets.

C = 20·5 when the longitudinal seams are lap joints.

If the minimum tensile strength of shell plates is other than 28 tons per square inch, these values of C should be correspondingly modified.

B = the least percentage of strength of longitudinal joint found as follows :—

For plate at joint $B = \frac{p - d}{p} \times 100$

For rivets at joint $B = \frac{n \times a}{p \times t} \times 85$ where steel rivets are used.

$B = \frac{n \times a}{p \times t} \times 70$ where iron rivets are used.

where p = pitch of rivets in inches.

t = thickness of plate in inches.

d = diameter of rivet holes in inches.

n = number of rivets used per pitch in the longitudinal joint.

a = sectional area of rivet in square inches.

(In case of rivets in double shear 1·75*a* is to be used instead of *a*.)

NOTE.—The inside butt strap to be at least ⅝ of the strength of the longitudinal joint.

NOTE.—For the shell plates of superheaters or steam chests enclosed in the uptakes or exposed to the direct action of the flame, the co-efficients should be ⅔ of those given in the preceding tables.

Proper deductions are to be made for openings in shell.

All manholes in circular shells to be stiffened with compensating rings.

The shell plates under domes in boilers so fitted to be stayed from the top of the dome or otherwise stiffened.

STAYS.

Section 13. 1. The strength of stays supporting flat surfaces is to be calculated from the smallest part of the stay or fastening, and the strain upon them is not to exceed the following limits, namely :—

2. **Iron Stays.**—For stays not exceeding $1\frac{1}{2}$ inches smallest diameter, and for all stays which are welded 6,000 lbs. per square inch ; for unwelded stays above $1\frac{1}{2}$ inches smallest diameter, 7,500 lbs. per square inch.

3. **Steel Stays.**—For **screw** stays not exceeding $1\frac{1}{2}$ inches smallest diameter, 8,000 lbs. per square inch ; for **screw** stays above $1\frac{1}{2}$ inches smallest diameter, 9,000 lbs. per square inch. For other stays not exceeding $1\frac{1}{2}$ inches smallest diameter, 9,000 lbs. per square inch, and for stays exceeding $1\frac{1}{2}$ inches smallest diameter, 10,400 lbs. per square inch. No steel stays are to be welded.

4. **Stay Tubes.**—The stress is not to exceed 7,500 lbs. per square inch.

FLAT PLATES.

Section 14. 1. The strength of flat plates supported by stays is to be taken from the following formula :—

$\frac{C \times T^2}{P^2}$ = working pressure in lbs. per square inch ;

where T = thickness of plate in sixteenths of an inch,

P^2 = square of pitch in inches. If the pitch in rows is not equal to that between the rows, then the mean of the squares of the two pitches is to be taken,

C = 90 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with screw stays with riveted heads,

C = 100 for iron or steel plates above $\frac{7}{16}$ thick fitted with screw stays with riveted heads,

C = 110 for iron or steel plates $\frac{7}{16}$ thick and under, fitted with stays and nuts,

C = 120 for iron plates above $\frac{7}{16}$ thick, and for steel plates above $\frac{7}{16}$ and under $\frac{9}{16}$ thick, fitted with screw stays and nuts,

C = 135 for steel plates $\frac{9}{16}$ thick and above, fitted with screw stays and nuts,

C = 140 for iron plates fitted with stays with double nuts,

C = 150 for iron plates fitted with stays with double nuts and washers outside the plates, of at least $\frac{1}{3}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

C = 160 for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, of at least $\frac{2}{5}$ of the pitch in diameter and $\frac{1}{2}$ the thickness of the plates,

C = 175 for iron plates fitted with stays with double nuts and washers riveted to the outside of the plates, when the washers are at least $\frac{2}{3}$ of the pitch in diameter and of the same thickness as the plates.

For iron plates fitted with stays with double nuts and doubling strips riveted to the outside of the plates, of the same thickness as the plates, and of a width equal to $\frac{2}{3}$ the distance between the rows of stays, C may be taken as 175, if P is taken to be the distance between the rows, and 190 when P is taken to be the pitch between the stays in the rows.

For steel plates, other than those for combustion chambers, the values of C may be increased as follows :—

C = 140	increased to	175,
150	,,	185,
160	,,	200,
175	,,	220,
190	,,	240.

2. If flat plates are strengthened with doubling plates securely riveted to them, having a thickness of not less than $\frac{2}{3}$ of that of the plates, the strength to be taken from

$$\frac{C \times (T + \frac{t}{2})^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where t = thickness of doubling plates in sixteenths, and C, T and P are as above.

Note.—In the case of front plates of boilers in the steam space, these numbers should be reduced 20 per cent., unless the plates are guarded from the direct action of the heat.

3. For steel tube plates in the nest of tubes the strength to be taken from

$$\frac{140 \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where T = the thickness of the plates in sixteenths of an inch,

P = the *mean* pitch of stay tubes from centre to centre.

For the wide water spaces between the nests of tubes the strength to be taken from

$$\frac{C \times T^2}{P^2} = \text{working pressure in lbs. per square inch ;}$$

where P = the horizontal distance from centre to centre of the bounding rows of tubes, and

C = 120 where the stay tubes are pitched with two plain tubes between them and are not fitted with nuts outside the plates,

C = 130 if they are fitted with nuts outside the plates,

C = 140 if each alternate tube is a stay tube not fitted with nuts,

C = 150 if they are fitted with nuts outside the plates,

C = 160 if every tube in these rows is a stay tube and not fitted with nuts,

C = 170 if every tube in these rows is a stay tube and each alternate stay tube is fitted with nuts outside the plates.

4. The thickness of tube plates of Combustion Chambers in cases where the pressure on the top of the chambers is borne by these plates is not to be less than that given by the following rule :—

$$T = \frac{P \times W \times D}{1750 \times (D - d)}$$

where P = working pressure in lbs. per square inch.

W = width of Combustion Chamber between plates in inches.

D = horizontal pitch of tubes in inches.

d = inside diameter of plain tubes in inches.

T = thickness of tube plates in sixteenths of an inch.

GIRDERS.

Section 15. The strength of girders supporting the tops of combustion chambers and other flat surfaces to be taken from the following formula :—

$$\frac{C \times d^2 \times T}{(L-P) \times D \times L} = \text{working pressure in lbs. per square inch ;}$$

where L = width between tube plates, or tube plate and back plate of chamber,

P = pitch of stays in girders,

D = distance from centre to centre of girders,

d = depth of girder at centre,

T = thickness of girder at centre. All these dimensions to be taken in inches.

Wrought Iron.

$$C = \begin{cases} 6{,}000, \text{ if there is one stay to each girder.} \\ 9{,}000, \text{ if there are two or three stays to each girder.} \\ 10{,}000, \text{ if there are four or five stays to each girder.} \\ 10{,}500, \text{ if there are six or seven stays to each girder.} \\ 10{,}800, \text{ if there are eight stays or above to each girder.} \end{cases}$$

Wrought Steel.

$$C = \begin{cases} 7{,}110, \text{ if there is one stay to each girder.} \\ 10{,}660, \text{ if there are two or three stays to each girder.} \\ 11{,}850, \text{ if there are four or five stays to each girder.} \\ 12{,}440, \text{ if there are six or seven stays to each girder.} \\ 12{,}800, \text{ if there are eight stays or above to each girder.} \end{cases}$$

If the minimum tensile strength of girder plates is other than 28 tons per square inch, these values of C should be correspondingly modified.

CIRCULAR FURNACES.

Section 16. 1. The strength of plain furnaces to resist collapsing to be calculated as follows :—

Where the length of the plain cylindrical part of the furnace exceeds 120 times the thickness of the plate, the working pressure is to be calculated by the following formula :—

$$\frac{1{,}075{,}200 \times T^2}{L \times D} =$$

working pressure in lbs. per square inch ;

Where the length of the plain cylindrical part of the furnace is less than 120 times the thickness of the plate, the working pressure is to be calculated by the following formula :—

$$\frac{50 \times (300T - L)}{D} =$$

working pressure in lbs. per square inch,

where D = outside diameter of furnace in inches,

T = thickness of plates in inches,

L = length of plain cylindrical part in inches, measured from the centres of the rivets connecting the furnaces to the flanges of the end and tube plates, or from the commencement of the curvature of the flanges of the furnace where it is flanged or fitted with Adamson rings.

2. In the furnaces referred to below the formulæ given are applicable if the steel used has a tensile strength of not less than 26 nor more than 30 tons per square inch. If the material of furnaces has a less tensile strength than 26 tons per square inch, then for each ton per square inch which the minimum tensile strength falls below 26, the co-efficient is to be correspondingly decreased by $\frac{1}{26}$th part.

3. The strength of corrugated furnaces made on Fox's, Morison's, Deighton's, or Beardmore's plan, to be calculated from

$$\frac{1{,}259 \times (T-2)}{D} =$$

working pressure in lbs. per square inch.

4. The strength of spirally corrugated furnaces is to be calculated from the following formula :—

$$\frac{912 \times (T-2)}{D} =$$

working pressure in lbs. per square inch ;

where T = thickness of plate in sixteenths of an inch,

and D = outside diameter of corrugated furnaces, in inches.

5. The strength of the Improved Purves' furnaces with ribs 9 inches apart, and of Brown's Cambered furnaces with ribs either 8 inches or 9 inches apart, to be calculated from the following formula :—

$$\frac{1{,}160 \times (T-2)}{D} =$$

working pressure in lbs. per square inch.

where T = thickness of plate in sixteenths of an inch,

and D = smallest outside diameter of furnaces, in inches.

6. The strength of the Leeds Forge bulb furnace is to be calculated from the following formula :—

$$\frac{1,259 \times (T-2)}{\mathbf{D}} = $$

working pressure in lbs. per square inch ;

where T = thickness of plate in sixteenths of an inch,

and $\mathbf{D}$ = smallest outside diameter in inches.

7. The strength of Holmes' patent furnaces, in which the corrugations are not more than 16 inches apart from centre to centre, and not less than 2 inches high, to be calculated from the following formula :—

$$\frac{945 \times (T-2)}{\mathbf{D}} = $$

working pressure in lbs. per square inch ;

where T = thickness of plain portions of furnace in sixteenths of an inch,

and $\mathbf{D}$ = outside diameter of plain parts of the furnace in inches.

Donkey Boilers.

Section 17. The iron used in the construction of the fire boxes, uptakes, and water tubes of donkey boilers shall be of good quality, and to the satisfaction of the Surveyors, who may in any cases where they deem it advisable apply the following tests :—

Thickness of Plates.	To Bend cold through an angle of	
	With the Grain.	Across the Grain.
$\frac{5}{16}$	80°	45°
$\frac{6}{16}$	70°	35°
$\frac{7}{16}$	55°	25°
$\frac{8}{16}$	40°	20°

The material to stand bending *hot* to an angle of 90 degrees, over a radius not greater than $1\frac{1}{2}$ times the thickness of the plates.

RULES FOR DETERMINING SIZES OF SHAFTS.

Section 18. 1. The diameters of intermediate shafts are to be not less than those given by the following formula :—

For Compound Engines with two cranks at right angles—

Diameter of intermediate shaft in inches =

$$(\cdot 04\,\mathbf{A} + \cdot 006\,\mathbf{D} + \cdot 02\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Triple expansion engines with three cranks at equal angles—

Diameter of intermediate shaft in inches =

$$(\cdot 038\,\mathbf{A} + \cdot 009\,\mathbf{B} + \cdot 002\,\mathbf{D} + \cdot 0165\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with two cranks at right angles—

Diameter of intermediate shaft in inches =

$$(\cdot 034\,\mathbf{A} + \cdot 011\,\mathbf{B} + \cdot 004\,\mathbf{C} + \cdot 0014\,\mathbf{D} + \cdot 016\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with three cranks—

Diameter of intermediate shaft in inches =

$$(\cdot 028\,\mathbf{A} + \cdot 014\,\mathbf{B} + \cdot 006\,\mathbf{C} + \cdot 0017\,\mathbf{D} + \cdot 015\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

For Quadruple expansion engines with four cranks—

Diameter of intermediate shaft in inches =

$$(\cdot 033\,\mathbf{A} + \cdot 01\,\mathbf{B} + \cdot 004\,\mathbf{C} + \cdot 0013\,\mathbf{D} + \cdot 0155\,\mathbf{S}) \times \sqrt[3]{\mathbf{P}}$$

where $\mathbf{A}$ = diameter of High Pressure Cylinder in inches,

$\mathbf{B}$ = diameter of first Intermediate Cylinder in inches,

$\mathbf{C}$ = diameter of second Intermediate Cylinder in inches,

$\mathbf{D}$ = diameter of Low Pressure Cylinder in inches,

$\mathbf{S}$ = Stroke of Pistons in inches,

$\mathbf{P}$ = Boiler pressure above atmosphere in lbs. per square inch.

2. The diameter of crank shaft, and of thrust shaft under the collars, to be at least $\frac{21}{20}$ths of that of the intermediate shaft. The diameter of thrust shaft may be tapered off at each end to the same size as that of the intermediate shaft.

3. The diameter of the screw shaft to be equal to the diameter of intermediate shaft (found as above) multiplied by $\left(\cdot 63 + \frac{\cdot 03\,\mathbf{P}}{\mathbf{T}}\right)$, but in no case to be less than $1\cdot 07\,\mathbf{T}$,

where $\mathbf{P}$ is the diameter of propeller, and

$\mathbf{T}$ the diameter of intermediate shaft, both in inches.

This size of screw shaft is intended to apply to shafts fitted with continuous liners the whole length of the stern tube, as provided for in Section 8, paragraph 3. If no liners are used or if two separate liners are used, the diameter of the shaft should be $\frac{21}{20}$ths that given above.

The diameter of screw shaft is to be tapered off at the forward end to the size of the crank shaft.

4. NOTE.—The Rules are intended to apply to Two Cylinder Compound Engines, in which the ratio of areas of Low and High Pressure Cylinders does not exceed 4·5 to 1 ; to Triple Expansion Engines in which it does not exceed 9 to 1 ; to Quadruple Expansion Engines in which it does not exceed 12 to 1 ; and in all cases, as regards the stroke, in which the length of stroke is not less than one half the diameter or greater than the diameter of the Low Pressure Cylinder. Engines of extreme proportions beyond these limits being specially submitted to be dealt with on their merits.

PERIODICAL SURVEYS. (*See* N.B.)

Section 19. 1. The machinery and boilers of all steam ships and the donkey boilers of sailing vessels are to be surveyed annually if practicable, and in addition are to be submitted to a Special Survey upon the occasions of the vessels undergoing the Special periodical Surveys Nos. 1, 2, and 3, prescribed in the Rules, unless the machinery and boilers have been specially surveyed within a period of twelve months.

2. At these Special Surveys, and on other occasions if deemed necessary by the Surveyors, the propeller, stern-bush, sea connections, and their fastenings, are to be examined while the vessel is in dry dock.

3. The stern shaft is to be examined annually and drawn at intervals of not more than two years.*

4. The cylinders, pistons, slide valves, crank and tunnel shafts, and pumps are to be examined, and if necessary the condenser is to be examined and tested.

5. The arrangements of cocks, pipes, bilge-suctions, roses, &c., are to be examined.

6. The boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure ; the safe working pressure is to be determined by their actual condition.

7. The safety valves are to be examined and set to the safe working pressure.

8. If satisfactory, these Surveys will be recorded in the Register Book thus :—" LMC6,11 " *in red* or " B&MS6,11 " *in red.*

9. " LMC " (LLOYD'S MACHINERY CERTIFICATE) denotes that the machinery and boilers are fitted in accordance with the Rules ; and when followed by a date, indicates that they were found at that time to be in good condition. MS. with a date denotes that the engines at that time were found upon inspection to be in good condition. BS. with a date denotes that the boilers were found upon inspection at that time to be in good condition.

10. " B&MS " (BOILERS AND MACHINERY SURVEYED), with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

11. In the event of either the machinery or boilers appearing to be impaired to such an extent as to render it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

BOILERS.

12. The boilers of all steam ships and the donkey boilers of sailing vessels are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

13. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure ; the safe working pressure is to be determined by their actual condition.

14. The safety valves are to be examined and set to the safe working pressure.

15. If satisfactory these surveys will be recorded in the Register Book thus :—" BS6,11 " *in red* in the case of steam vessels, and " DBS6,11 " *in red* in the case of sailing vessels.

* On the application of owners, the Committee will be prepared to give consideration to the circumstances of any special case.

16. "BS" (Boilers Surveyed) or "DBS" (Donkey Boiler Surveyed), with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

17. In the event of the boilers appearing to be impaired to such an extent as to render it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

71, FENCHURCH STREET, LONDON, E.C.

11th May, 1911.

N.B.—In reference to the Rules above quoted, and in order to prevent the disappointment arising from Ships losing their Characters from want of survey, it is hereby intimated that the duty of giving NOTICE OF PERIODICAL SURVEYS *required by the Rules, or when repairs are necessary in consequence of damage, or from other causes, rests with the Owners, Masters, or Agents.*

By order of the Committee,

ANDREW SCOTT,

Secretary.

RULES FOR THE SURVEY OF INTERNAL COMBUSTION ENGINES FOR MARINE PURPOSES.

GENERAL.

Section 1. In vessels propelled by Internal Combustion Engines, the Rules as regards Machinery will be the same as those relating to steam engines so far as regards the testing of material used in their construction and the fitting of sea connections, discharge pipes, shafting, stern tubes and propellers.

CONSTRUCTION.

Section 2. 1. The following points should be observed in connection with the design of the engines.

2. The shaft bearings, connecting rod brasses, the valve gear, the inlet and exhaust valves must be easily accessible.

3. The reversing gear and clutch must be strongly constructed and easily accessible for examination and adjustment.

4. In engines of above 60 B.H.P. which are not reversible and which are manœuvred by clutch, a governor or other arrangement must be fitted to prevent racing of the engine when declutched.

5. Efficient positive means of lubrication (preferably sight feed) must be fitted to each part requiring continuous lubrication.

6. If the engines are of the closed-in type, they must be so fitted that the contained lubricating oil can be drained when necessary, and in wood vessels an easily drained metal or metal-lined tray must be fitted to prevent leakage of either fuel oil or of lubricating oil from saturating the wood work.

7. Carburettors, where petrol is used, and vaporisers, where paraffin is used, should be so designed that when the engine is stopped the fuel supply is automatically shut off. If an overflow is provided in the carburettor or vaporiser, a gauze covered tray with means of draining it must be fitted to prevent the fuel from flowing into the bilges.

Strong metallic gauze diaphragms should be fitted either between the carburettor (or vaporiser) and cylinders or at the air inlets.

8. If the ignition is electric, either by magneto or by coil and accumulator, all electric leads must be well insulated and suitably protected from mechanical injury. The leads should be kept remote from petrol pipes, and should not be placed where they may be brought into contact with oil.

The Commutator must be enclosed; and the sparking coils must not be placed where they can be exposed to explosive vapours.

9. No exposed spark gap should be fitted.

10. In paraffin and heavy oil engines where lamps are used for ignition or for vaporising, these lamps should be fixed by some suitable bracket, and the flame enclosed when in use.

11. The circulating pump sea suction is to have a cock or valve on the vessel's skin placed on the turn of the bilge in an easily accessible position, and the circulating pipe is to be provided with an efficient strainer inside the vessel. The discharge overboard is to be fitted with a cock or valve on the vessel's skin if it is situated under or near the load line of the vessel.

12. A bilge pump worked by the engines or an independent power-driven bilge pump is to be fitted, to draw from each part of the vessel. In open launches this bilge pump may be omitted provided suitable hand pumps are fitted.

13. The cylinders are to be tested by hydraulic pressure to twice the working pressure to which they will be subjected. The water jackets of the cylinders to 50lbs. per square inch, and the exhaust pipes and silencer to 100lbs. per square inch.

14. The exhaust pipes and silencer should be efficiently water cooled or lagged to prevent damage by heat, and if the exhaust is led overboard near the water-line, means must be arranged to prevent water from being syphoned back to the engine.

15. The machinery must be tried under full working conditions, the report stating the approximate speed of vessel, the number of revolutions of the engines at full power, both ahead and astern, and the lowest number of revolutions of the engines which can be maintained for manœuvring purposes.

RULES FOR DETERMINING SIZES OF SHAFTS.

Section 3. The crank, intermediate, and other shafts if of ordinary mild steel are to be of not less diameters than as given in the following table. When special steel is used, the sizes are to be submitted for consideration.

1. For Petrol or Paraffin Engines for smooth water services:—

$$\left.\begin{array}{r}\text{Diameter of crank}\\\text{shaft in inches}\end{array}\right\} = \mathbf{C}\sqrt[3]{\mathbf{D}^2\,\mathbf{S}}$$

where $\mathbf{D}$ = diameter of cylinder in inches,

$\mathbf{S}$ = stroke of piston in inches.

Four Stroke Cycle.	Two Stroke Cycle.	Bearing between each crank.	Two cranks between the bearings.
For 1, 2, 3, or 4 Cyls.	1 or 2 Cyls.	$\mathbf{C}$ = ·34	$\mathbf{C}$ = ·38
" 6 "	3 "	$\mathbf{C}$ = ·36	$\mathbf{C}$ = ·40
" 8 "	4 "	$\mathbf{C}$ = ·38	$\mathbf{C}$ = ·425
" 12 "	6 "	$\mathbf{C}$ = ·44	$\mathbf{C}$ = ·49

For open sea service add ·02 to $\mathbf{C}$.

$$\left.\begin{array}{r}\text{Diameter of inter-}\\\text{mediate and screw}\\\text{shafts in inches}\end{array}\right\} = \mathbf{C}\sqrt[3]{\mathbf{D}^2\,\mathbf{S}\,(n+3)}$$

where $\mathbf{D}$ = diameter of cylinder in inches,

$\mathbf{S}$ = stroke of piston in inches,

n = number of cylinders.

For smooth water services—	For open sea services—
$\mathbf{C}$ = ·155 for intermediate shafts.	$\mathbf{C}$ = ·165
$\mathbf{C}$ = ·170 for screw shafts fitted with continuous liners.	$\mathbf{C}$ = ·180
$\mathbf{C}$ = ·180 for screw shafts fitted with separate liners or with no liners.	$\mathbf{C}$ = ·190

In engines of two-stroke cycle, n is to be taken as twice the number of cylinders.

2. When ordinary deep thrust collars are used the diameter of the shaft between the collars is to be at least $\frac{21}{20}$ths of that of the intermediate shaft.

3. In the cases of **Diesel** and other Engines in which very high initial pressures are employed, particulars should be submitted for special consideration.

FUEL TANKS AND CONNECTIONS.

Section 4. 1. Separate fuel tanks are to be tested with all fittings, to a head of at least 15 feet of water. If pressure feed tanks are employed, they are to be tested to twice the working pressure which will come on them but at least to a head of 15 feet of water. If the tanks are made of iron or steel they should be galvanized.

2. Strong and readily removable metallic gauze diaphragms should be fitted at all openings on petrol tanks.

3. Paraffin or heavy oil tanks, not used under pressure, are to be fitted with air pipes leading above deck. Pressure-feed tanks and tanks containing petrol, should be provided with escape valves discharging into pipes leading to the atmosphere above deck. The upper ends of all air pipes are to be turned down and pipes above 1 inch diameter are to be provided with gauze diaphragms at the end.

4. No glass gauges are to be fitted to fuel tanks containing either petrol, paraffin or heavy oil.

5. Filling pipes are to be carried through the deck so that the gas displaced from the tanks has free escape to the atmosphere.

6. Separate fuel tanks should be provided with metal-lined trays to prevent any possible leakage from them flowing into the bilges, or saturating woodwork. Arrangements are to be provided for emptying the tanks and draining the trays beneath them. For petrol tanks the trays must have drains leading overboard where possible or they should be gauze covered trays with means for draining them.

7. All fuel pipes are to be of annealed seamless copper with flexible bends. Their joints are to be conical, metal to metal. A cock or valve is to be fitted at each end of the pipe conveying the fuel from the tank to the carburettor or vaporiser. The fuel pipes should be led in positions where they are protected from mechanical injury and can be exposed to view throughout their whole length.

8. The engine room, and the compartment in which the fuel tanks are situated, are to be efficiently ventilated.

9. An approved fire extinguishing apparatus must be supplied.

PERIODICAL SURVEYS.

Section 5. 1. The machinery is to be submitted to survey annually. At these surveys the cylinders, pistons, connecting rods, crank and other shafts, inlet and exhaust valves and gear, clutches, reversing gear, propeller, sea connections, and pumps are to be examined. The electric ignition is to be examined and the electric leads tested. The fuel tanks and all connections are to be examined, and if deemed necessary by the Surveyor, to be tested to the same pressure as required when new. If practicable, the engines should be tested under working conditions.

2. The screw shaft is to be drawn at intervals of not more than four years.

71, Fenchurch Street, London, E.C.
16*th June*, 1910.

By order of the Committee,
ANDREW SCOTT,
Secretary.

USE OF ELECTRIC LIGHT ON BOARD VESSELS.

The following requirements as to the sizes, positions, and protection of the cables, and to the fitting of the cut-outs are now embodied as Rules.

LEADS OR CIRCUITS.

1. The sectional area of the copper wires in the cables should be at least in the proportion of one square inch per 1,000 ampères carried.

2. No single wire of greater size than 14 or of less than 18 standard wire gauge should be used. For portable leads, cables composed of stranded wires should be used having sufficient conductivity and flexibility for the purposes intended.

3. The copper used in all wires or cables should have a conductivity of at least 98 per cent. that of pure copper.

4. The insulation resistance of all wires, including portable leads, should be not less than 600 megohms per statute mile, after 24 hours immersion in sea water.

5. The insulating material used must not appreciably soften if subjected to a temperature of 180° F. If india-rubber insulation is used, the wires should be first covered with a layer of pure rubber, then with a separator, then with a layer of vulcanizing india-rubber, and then with a layer of india-rubber coated tape. The whole should then be vulcanized together. The cable should afterwards be satisfactorily protected, preferably with a braided covering of waterproof fibre.

6. Wires which are insulated with any other material than india-rubber should fulfil the same conditions as to insulation resistance, and should be of equal durability with those above specified.

JOINTS.

7. Joints in branches, or of branches with leads of small circuits, must be made in properly constructed watertight junction boxes, or should have the copper wires thoroughly soldered and the insulation carefully carried out, all the joints being made watertight. Joints in flow and return wires should not be made opposite one another. All joints should be in accessible positions, none being made in bunkers, cargo spaces, or spaces which may at any time be used for carrying cargo, stores or baggage.

8. For soldering wires, resin only should be used as a flux.

9. Where practicable, the leads should be placed where they can always be accessible; if they are laid in wood battens the covers should be screwed on, not nailed, and care should be taken that the casings are so arranged that water will not lodge in them. Cables which are properly covered with protective metal sheathing, or which are protected by galvanized wire armouring, may be unencased. They should, however, be secured by screwed clips, not by staples. All sharp bends in cables should be avoided.

10. All cables which are liable to be exposed to the weather or moisture should be lead covered, or be otherwise specially protected. Where great heat is experienced, no wood casing should be used, but the cables should be protected by iron casings, or if they are not exposed to mechanical injury, they may be armoured with galvanized wire and fastened to decks or bulkheads with screwed clips spaced not more than 12 inches apart.

11. If cables are led through cargo spaces, coal bunkers, or spaces which may at any time be used for carrying cargo, stores, or baggage, or which are not at all times accessible, they should be strongly protected against damage, preferably by iron casings. If they are led through metal tubes, these must be strongly secured, and should be fitted so that water cannot lodge in them.

Armoured cables may be used without casings or tubes provided they are strongly secured to the under side of decks or to bulkheads by screwed clips and provided they are

armoured in conformity with the standard of the Engineering Standards Committee, viz. :—

For cables below $\frac{1}{2}$ inch diameter over lead by galvanized steel wires ·072 diameter, for cables $\frac{1}{2}$ inch to 1 inch over lead by two layers of steel tape each ·03 inch thick, for cables above 1 inch to 2 inches diameter by two layers of steel tape each ·04 inch thick, and for larger cables by two layers of steel tape ·06 thick.

12. Where cables pass through beams, bulkheads, or other iron work, they should be led through special fittings of sheet lead, hard wood or vulcanized fibre to prevent their being chafed, and where they pass through decks they should be led through metal tubes lined with wood, or vulcanized fibre, and securely fastened to the decks, standing at such a height above the deck level that water cannot stand above them. Where cables pass through watertight bulkheads the fittings should be provided with brass watertight screwed glands.

13. In vessels having spaces allotted alternately for passengers and cargo the lamp fittings in these spaces should be removable, and the terminals so arranged that they can be properly covered up with strong metal covers, or the whole of the fittings should be similarly provided with strong metal covers. The main switches and cut-outs should be outside these spaces, or if placed inside, they should be in strong iron boxes provided with iron covers, or otherwise securely arranged to prevent the fittings being tampered with.

DISTRIBUTION.

14. A main switchboard should be fitted in the dynamo room, to which all the main circuits throughout the ship should be brought, a switch and cut-out being fitted thereon for each circuit. The auxiliary switchboards for further sub-division of the current should be placed in conveniently accessible positions, and each such switchboard should be similarly fitted with a separate switch and cut-out for each sub-circuit. Cut-outs should be fitted to each lamp circuit where these are made with reduced size of wire. If vessels are wired on the double-wire system, cut-outs should be fitted to each cable of these circuits.

15. In cases where electric lights are used for the mast-head light and side lights, the switches controlling these lights should be placed in a position where they can be controlled by the Officer of the watch, or other responsible person, and cannot be tampered with by other members of the crew, or by passengers, &c.

16. The switchboards should be of slate or other incombustible material. The switches should be on the quick break principle, and should be so constructed that they must be either full "on" or completely "off," that is, they must not be able to remain in an intermediate position. They should have ample rubbing surfaces, and their conductivity should not be less than that of the wires connected to them.

17. Cut-outs should be fitted to each main or auxiliary circuit, on the switchboards, as near as possible to the switches of these circuits. If the switchboard is not fitted near the dynamo, or if more than one dynamo may be used on any one circuit, then cut-outs should also be fitted to the main cable as near as possible to each of the dynamo terminals.

18. All other cut-outs should also be in easily accessible places, and as near as possible to the commencement of the cables or wires they protect. They should be mounted on slate or other incombustible bases, and be arranged so that the fused metal may not be a source of danger, and where fitted with covers these should be incombustible.

19. All fuses should be of easily fusible and non-oxidizable metal, and should be so proportioned as to melt with a current of 100 per cent. in excess of the normal current, that is they should melt with a current in the proportion of 2,000 ampères per square inch of section of the wires they protect. The fuses for branch wires to single lights should, however, if of tin wire, be of not greater size than 22 s.w.g.

20. The fuses for each cable should be made of standard dimensions, so that a large fuse cannot be used for a small cable by mistake, or, if wire fuses are used, permanent instructions should be fitted on or near each switchboard, giving particulars of the proper size of fuse for each circuit.

21. In shaft passages, and in damp places, all lamp switches and cut-outs should be of a strong watertight pattern, or should be placed in watertight boxes having hinged or portable watertight covers. No switches or cut-outs are to be placed in bunkers.

22. There should be no joints in the cables leading from the dynamo to the main switchboard, nor in those leading from the main to auxiliary switchboards, nor should branches to single lamps be taken off these cables.

23. A voltmeter should be supplied with each installation. If more than one dynamo is fitted, neither being capable of the whole of the output, an ampère meter should be supplied with each dynamo.

JOINTS WITH HULL.

24. In vessels fitted on the single-wire system, all the joints with the hull should be placed in accessible positions. Those for single lamps or for small cables should be made with brass screws not less than three-eighths of an inch in diameter, carefully tapped into the iron or steel, having white brass washers, between the wires and the vessel, or the wires should be soldered to brass faced-washers. For larger cables and for the pole of dynamo the cable wires should be properly sweated into brass or copper shoes, which should be bolted to the vessel. The iron or steel where contact is made should be filed bright, and the area of contact should not be less than eight times the section of the copper of the cable.

IN VESSELS CARRYING PETROLEUM.

25. The single wire system must not be adopted for any part of the installation. Switches and cut-outs must not be fitted in places liable to the accumulation of petroleum vapour or gas, and all lamps in places where it is possible for gas to accumulate must be made with an outer glass globe made air tight. All wires in such places are to be lead covered, or the insulation of the cables employed is to be of such a nature as not to be affected by petroleum. No joints of cables, switches, or cut-outs should be fitted in the pump room, but the wires for each lamp therein should be carried to the lamp from a distributing junction box placed outside the pump room or companion.

The following paragraphs referring to the effect of the Electric Light Installations upon the Compasses are issued as suggestions, not as Rules.

POSITION OF DYNAMOS AND OF ELECTRIC MOTORS.

26. The position and type of Dynamos and Electric Motors should be such that the compasses will not be affected. Dynamos and large motors should be at least 30 feet from the standard compass.

71, Fenchurch Street, London, E.C.

17th June, 1909.

CABLES.

27. In vessels fitted with continuous current dynamos, and wired on the single-wire system, no single cable should be carried within 15 feet of any compass, and cables conveying heavy currents should be fixed at still greater distance. If it is necessary to fix any cables within this distance, then for all parts of the vessel lighted from this cable the concentric or double-wire system should be adopted, the return wire being carried as near the flow as possible in the vicinity of the compasses.

ADJUSTMENT OF COMPASSES.

28. The compasses should be adjusted with the dynamo not working, after which the vessel's head should be put upon the different courses, with the dynamo running at full-speed, and on each course the indications of the compass should be noted with the dynamo running with open circuit and with all possible combinations of the current switched "on" and "off" all circuits passing near the compasses. These indications should be compared with those obtained with the dynamo stopped, and any serious deflections of the compasses remedied before the vessel sails.

The requirements in paragraphs 3 to 8 inclusive, referring to the quality of the material used, or to the workmanship employed, are embodied as Rules; but as the quality of the material can only be tested at the Cable Makers' works, and as the workmanship of the joints cannot be examined or tested after completion, the guarantee of the Electrical Engineers will be required as to these points.

By order of the Committee,

ANDREW SCOTT,

Secretary.

REFRIGERATING MACHINERY AND APPLIANCES.

On the application of the owners of vessels fitted for carrying refrigerated cargoes, the Committee will authorize their Surveyors to survey the refrigerating machinery and appliances, and in those cases where the following conditions are complied with and a satisfactory report is received from the Surveyor, certificates of these Surveys will be issued and the notation R.M.C. (*in red*) (*i.e.* Refrigerating Machinery Certificate) will be made against the vessel's name in the Society's Register Book, and in the special list of vessels fitted with refrigerating appliances. In cases in which the refrigerating machinery and appliances are constructed under the special survey of the Society's Surveyors and to their entire satisfaction, the notation ✠ R.M.C. (*in red*) will be made in the Register Book. The name of the maker and description and number of the refrigerating machines, whether single or duplex, and the refrigerating power of the machines will be recorded in the special list in the Register Book, as will also the number and capacity of insulated cargo chambers and the nature of the insulation and the method employed for cooling the holds.

1. The insulation must be sound and in good order and of efficient construction. The details of construction showing the amount and nature of the insulating material employed in the various parts are to be reported to the Committee.

Bilge suction and sounding pipes and ballast tank air and sounding pipes, passing through insulated spaces, should be well insulated to prevent their being frozen up. No sluice valves, scuppers or drain pipes are to be fitted which will permit drainage from spaces outside of the insulated chambers into the bilges of the insulated holds.

It is *recommended* that the wood-work of the insulation over tunnel tops be fastened with screws to facilitate the examination of this part, and that extra strong battens of American Elm be fitted upon it under the hatches. Insulated removable portions are to be arranged in the bulkhead insulation, where required, to give easy access to sluice valves and bilge suction roses. The bottoms, sides and coamings of all insulated hatches and limbers should be painted to prevent decay.

Thermometer tube flanges and covers should be arranged so that water does not run down and freeze in them when taking the temperature.

Cargo battens should be provided for the floor or deck and the sides of the chambers previous to loading the homeward cargo. Those for the sides of the chambers should be fastened, and should be at least $1\frac{1}{2}$ inches in depth and 2 inches wide, one batten being placed over each frame or ground, the others being intermediately arranged. The battens for the floor and decks should be at least $2'' \times 2''$.

Where the brine system of refrigerating is employed, the brine circulating pipes and tanks should not be galvanized on the inside.

In cases where internally galvanized tanks and cooling pipes have been fitted, the brine cooling and return tanks, if closed, should be provided with two ventilating pipes communicating with the atmosphere. If the tanks are not closed, the cooling room should be efficiently ventilated.

2. The refrigerating machinery is to be of approved construction and of sufficient power to maintain the necessary low temperature in the cargo chambers in tropical climates when running 18 hours per day. For cargo capacities of above 70,000 cubic feet the machinery is to be either duplex or in duplicate.

3. A sufficient amount of spare gear is to be supplied and stowed where it is readily accessible.

No spare gear will, however, be required in cases where two complete sets of refrigerating machines are fitted *each* being of sufficient power to maintain the necessary low temperature in the cargo chambers in tropical climates when running 18 hours per day, provided all the working parts of these machines are interchangeable.

When two similar machines are fitted, each connected to different cargo compartments, one set of spare gear suitable for either machine will suffice.

Where one single dry air machine is fitted to each compartment, the following will be required :—

1 crank shaft with eccentric sheaves, complete, or one half shaft if the halves are interchangeable.
1 piston rod and nuts for steam and air cylinders.
1 set of piston rod and connecting rod brasses.
1 piston, complete, for each steam and air cylinder.
1 cylinder cover for each pattern used in steam and air cylinders.
1 air pump bucket and rod.
1 circulating pump bucket and rod.
1 pair main bearing brasses, complete.
Main and cut-off valves for each steam cylinder.
Balance springs and rings for steam and air slide valves.
False valve face for each pattern fitted in steam cylinders, with screws.
1 eccentric rod for each pattern used.
1 eccentric strap for each pattern used.
1 slide valve spindle and nuts for steam and air cylinders, for each pattern used.
2 main bearing bolts.
1 set of connecting rod and piston rod bolts.
Full set of air valves and seats for air compressor.
1 set of inlet and outlet valves, and 1 set valve faces (if fitted) for air expansion cylinder with screws.
1 set of valves for air, circulating and feed pumps.
1 set of escape valve springs.
50 suction springs.
50 delivery springs.
50 buffer springs.
6 tubes and 24 ferrules for condenser.
6 tubes for cooler.
6 tubes for air drying chamber.
Assorted bolts, studs and nuts.
1 set of lead lined nuts for air expansion cylinder cover.
A quantity of packings and joint rings.

Where one duplex or two single dry air machines are fitted to each compartment the following will be required :—

1 crank shaft with eccentric sheaves complete, or one half shaft if the halves are interchangeable.
1 piston rod and nuts for steam and air cylinders.
1 set of connecting rod and crosshead brasses.
1 piston for H.P. steam cylinder.
1 piston, complete, for air compressor ; and 1 for air expansion cylinder.
1 set of piston springs for each steam cylinder.
1 cylinder cover for each pattern used in air compression and expansion cylinders.
1 air pump bucket and rod.
1 circulating pump bucket and rod.
Main and cut-off slide valves and spindles with nuts complete for H.P. steam cylinder.
Balance springs and rings for steam and air slide valves.
1 H.P. steam cylinder valve and valve face with screws.
1 eccentric sheave, strap, and rod for each pattern used.
1 slide valve spindle and nuts for steam and air cylinders for each pattern used.
2 main bearing bolts.
1 set of connecting rod and piston rod bolts.
Half set of air valves and seats for air compressor.
1 inlet and 1 outlet valve, and half set of valve faces (if fitted) for air expansion cylinder, with screws.
1 set of valves for air, circulating, and feed pumps.
1 set of escape valve springs.
20 suction springs.
40 delivery springs.
40 buffer springs.
6 tubes and 24 ferrules for condenser.
6 tubes for cooler and 6 for air drying chamber.
Assorted bolts, studs and nuts.
$\frac{1}{2}$ set of lead lined nuts for air expansion cylinder cover.
A quantity of packings and joint rings.

Where one single ammonia or carbonic anhydride compression machine is fitted :—

1 crank shaft with eccentric sheaves, complete, or one half shaft if the halves are interchangeable.
Piston and rods complete with nuts for each steam cylinder and gas compressor.
1 air pump bucket and rod.
1 circulating pump bucket and rod.
1 pair main bearing brasses, complete.
1 set of connecting rod and crosshead brasses.
Main and cut-off valves for steam cylinders.
1 valve spindle for each pattern used and nuts complete.
1 eccentric strap and rod for each pattern used.
1 brine pump complete.

1 cover for each pattern used.
2 main bearing bolts.
1 set of connecting rod and piston rod bolts.
1 set compressor suction and delivery valves with springs and boxes, complete.
1 set of valves for air, circulating, feed, and brine pumps.
Crank shaft for fan engine.
1 steam piston and rod, etc., for fan engine, complete.
1 pair of connecting rod brasses for fan engines, with bolts, etc., complete.
1 set of blocks for making all leather packings used.
6 tubes and 24 ferrules for condenser.
Lengths and bends of piping of each size used, together with flanges, couplings, and screwing apparatus for effecting repairs.
1 gas regulating valve.
1 distributing and 1 collecting piece with multiple branches for coils for each pattern used. If these pieces are made of forged steel no spare pieces are required.
Sundry valves, cocks, flanges, and fittings.
Assorted bolts, studs, and nuts.
Quantity of leather packings and joint rings.

For ammonia and carbonic anhydride compression machines, the following spare gear will be required, where one duplex or two single machines are fitted to each compartment :—

1 crank shaft, or one half shaft if the halves are interchangeable.
1 steam piston rod and nut for each pattern used.
1 piston for H.P. steam cylinder, with springs, complete.
1 set of piston rings for each steam cylinder.
1 set of piston rings for each size of compressor.
1 compressor piston rod and nuts, complete, for each pattern used.
1 air pump bucket and rod.
1 circulating pump bucket and rod.
Main and cut-off slide valves for H.P. steam cylinder.
Main and cut-off valve spindles and nuts for H.P. steam cylinder.
1 eccentric sheave, strap, and rod, for each pattern used.
1 brine pump complete.
1 cover for each end of gas compressor, except where screwed plugs are used.
2 main bearing bolts.
½ set of connecting rod and piston rod bolts.
½ set compressor suction and 1 delivery valve with springs and box, complete.
1 set of valves for air, circulating, feed, and brine pumps.
1 steam piston and rod, etc., for fan engine, complete.
1 pair of connecting rod brasses for fan engines, with bolts, etc., complete.
1 set of blocks and leather for making all leather packings used.
6 tubes and 24 ferrules for condenser.
Lengths and bends of piping of each size used, together with flanges, couplings, and screwing apparatus for effecting repairs.
1 gas regulating valve.
1 distributing and 1 collecting piece with multiple branches for coils for each pattern used. If these pieces are made of forged steel no spare pieces are required.
Sundry valves, cocks, flanges and fittings.
Assorted bolts, studs and nuts.
A quantity of joint rings.

In cases where an independent circulating water pump is used, and its work *cannot* be performed by the main or auxiliary engines, a duplicate pump complete should be fitted.

In cases where an independent circulating water pump is used, and its work *can* be performed by the main or auxiliary engines, a pump bucket and rod should be carried, and ½ set of valves for water end.

In cases where an independent surface condenser with air, circulating and feed pumps combined is fitted, and its work *cannot* be performed by the main engines :—

1 crank shaft with eccentric sheaves complete.
1 piston and rod complete for each pattern used.
1 eccentric strap and rod complete for each pattern used.
1 slide valve and spindle complete for each pattern used.
1 pump bucket and rod complete for each pattern used.
1 set of connecting rod and piston rod bolts and nuts.
1 set of valves for air, circulating, and feed pumps.
6 condenser tubes and 12 ferrules.

In cases where an independent surface condenser with air, circulating, and feed pumps combined is fitted, and its work *can* be performed by the main engines :—

1 pump bucket and rod complete for each pattern used.

1 set of connecting rod and piston rod bolts and nuts.

½ set of valves for air, circulating, and feed pumps.

6 condenser tubes and 12 ferrules.

Periodical Surveys.

4. In the cases of vessels engaged on voyages of more than three months' duration, a complete examination, as detailed in par. 9, is required every voyage. If this examination is made at other than the loading port a further examination is required at the loading port. (*See* par. 11.)

5. In the cases of vessels engaged on voyages of more than two and not more than three months' duration, a complete examination as above detailed is required at each alternate voyage, but at the intermediate voyage a modified examination as described in par. 10 will be sufficient, but the survey at loading port provided for in par. 11 should be held every voyage.

6. In vessels engaged on shorter over-sea voyages, the above examinations are to be held at least every three months, alternate examinations being as provided for in pars. 9 and 10, but the survey at loading port provided for in par. 11 should be held every voyage.

In the cases of vessels engaged on voyages of only a few days' duration, the complete examinations are to be held at least every three months, alternate examinations being as provided for in pars. 9 and 10, but the examination of insulation, etc., provided for in par. 11, instead of being held every voyage need only be held at intervals of four or six weeks, as may be approved in each special case.

7. *If in any case only part of the requisite examinations is held, the certificate will be endorsed with a statement of what is required to complete the survey.*

8. The date following the record R.M.C. *in red* indicates the date of the last examination of the Refrigerating Machinery and appliances as above mentioned.

When the periodical Surveys provided for in pars. 4, 5 and 6 are not held, the record R.M.C. will be expunged.

9. The complete periodical Survey required in par. 4 will consist of the following :—

The insulation throughout the holds is to be carefully examined and tested for dryness and fullness by sounding with a hammer and by boring. The test holes are to be afterwards efficiently closed. Special attention is to be paid to the spaces under the snow boxes, trunks and hatches where dampness may accumulate, to the sides under stringers and under decks and to the tunnel tops. All limber hatches are to be removed, the limbers cleared, and the suction pipes and roses, sluices and sounding pipes are to be examined. Hatches, air trunk-ways and thermometer tubes with their connections and fastenings are to be examined, and where trunk-ways pass through watertight bulkheads, the watertight doors are to be examined and worked.

The trunk-ways should be as airtight as practicable and their fastenings should be secure.

The steam pipes, water pipes and connections, the crank shaft and bearings, connecting rods, steam and air cylinders, pistons, slides and valves, compressors and pistons, compressor rods and glands, surface condenser and air or gas coolers, circulating, air, feed and bilge pumps, are to be carefully examined and the condensers and coolers tested if deemed necessary.

The auxiliary machinery, where fitted, is also to be examined.

The spare gear is to be examined.

In dry air machines special attention is to be given to the condition of the air expansion cylinders, their pistons and valves. In other machines special attention is to be given to the condition of the compressors, including the pistons, rods and glands, and to the expansion valve.

The refrigerator coils and their connections and the brine pipes and tanks, where fitted, are to be carefully examined and tested if deemed necessary.

Where the brine may escape to the bilges, the cement is to be examined.

The machinery is to be examined under working conditions, and tested on the snow box or refrigerators, the time and fall of temperature being noted.

It is *recommended* that the examination of the machinery under working conditions should be made upon the vessel's arrival at a home port, before the cargo is *fully discharged*. Where brine pipes are fitted they should be examined when under frosted conditions.

10. The examination required at alternate voyages in pars. 5 and 6 will consist of the following :—

The Insulation and Trunkways are to be surveyed in the same manner as is required for the complete examination detailed above. (*See* par. 9.)

Provided the machinery when tested under working conditions is found to be satisfactory, the following parts only will be required to be examined at this Survey, viz. :—

Steam valves, air pump and circulating pump.
Crank shafts and bearings.
Air and other compressors and valves.
Expansion cylinder and valves in dry air machines.
Condenser water spaces.
Sea injection valves to be opened whenever the vessel is in dry dock.
Brine pipes in holds under frosted conditions.
The spare gear.

11. If the machinery and insulation have been surveyed and passed at a home port, the further survey required at a loading port will consist of an inspection to ascertain that the dunnage battens are in good order and that no damage has been sustained to the insulation prior to the loading of the refrigerated cargo, and also of a test of the refrigerating machinery under working conditions, the temperature in the hold being noted.

If the vessel loads at more than one port, one survey only at a loading port will be required, provided it includes the examination of all insulated spaces.

If there is no Surveyor to the Society available at the loading ports, or if there is not one obtainable from a port within a reasonable distance, this survey may be held at the port where the outward cargo is discharged. If there is no Surveyor to the Society at either of these ports, the Committee will accept the report of a survey held by a Surveyor appointed by Lloyd's Agent; or (in any case where there is no Lloyd's Agent) the report of a survey by a reliable Surveyor, if available; or (if no such Surveyor is available) a report signed by two competent Engineers of the vessel.

Fees.

12. The following are the charges that will be made for carrying out the above examination in the cases of classed vessels :—

	During Construction.			Subsequent Surveys every Voyage.		
	£	s.	d.	£	s.	d.
For installations under 80,000 cubic feet total capacity	6	0	0	3	0	0
For installations under 120,000 cubic feet total capacity	8	0	0	4	0	0
For installations above 120,000 cubic feet total capacity	10	0	0	5	0	0

As regards Unclassed Vessels the fees for the first survey of Refrigerating Machinery and Appliances will be double the amounts in column No. 1 when the survey is held during construction, and double the amounts in column No. 2 when it is held after the Installation has been fitted. Fees for subsequent surveys will be charged in accordance with column No. 2 as printed.

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, Fenchurch Street, London, E.C.

15*th December*, 1910.

EXTRACTS FROM THE RULES

OF THE LATE

UNDERWRITERS' REGISTRY FOR IRON VESSELS (FOR 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING),

SHOWING THE CONDITIONS OF CLASSIFICATION, &c.

REVISION OF CERTIFICATE OR SUSPENSION OF CLASS.

The certificate of class will remain good so long as the vessel, under periodical survey, is found worthy of it. In case of defects reported by the Surveyors not being made good, the class of the vessel will be revised or suspended by the Committee.

REFERENCE IN CASE OF COMPLAINT.

Any dispute shall be referred to three Shipbuilders or Engineers, one to be chosen by the Shipowner, one to be chosen by this Committee, and a third to act as umpire, to be chosen by the other two.

SURVEY FEES.

For surveying vessels periodically to ascertain condition, first visit	£1	1	0
For each succeeding visit, when more than one visit is necessary	0	10	6

For special surveys special charges will be made, subject to the control of the Committee.

PERIODICAL SURVEYS.

A thorough survey will be required once in every four years for vessels with an A1* or an **A1*** certificate; and once in every three years for vessels with an A1, **A1**, A or an **A** certificate. When vessels are abroad at the time they become due for survey, they must be examined on their return to the United Kingdom. The Surveyors are at all times to have free access to examine vessels holding a class in this Registry.

Vessels due for Periodical Survey which leave the United Kingdom without being duly surveyed and passed by the Surveyors to this Registry will have their class suspended until such survey has been properly made. Notice of Suspension of Class will be given in the first Supplement issued after the sailing of the vessel.

Vessels remaining abroad for two years after they become due for Periodical Survey will have their Class suspended until they have been re-surveyed.

First Survey.

The vessel to be placed in dry dock. (The bottom may be cleaned, but should not be recoated before survey.) While in dry dock the rudder, rudder pins and gudgeons, and the whole of the bottom outside, are to be thoroughly examined, and in steamers the connections of the sea-cocks and openings in the bottom are to be examined, to see that they are in an efficient condition.

The holds, and, in steamers, the bunkers also, are to be cleared, the loose ceiling in the flat of bottom is to be lifted, and the Surveyor is to satisfy himself that the bottom inside is in good order, and that the cement is in good condition and satisfactorily adhering to the iron.

He is also to examine the decks, beam ends, and the sides of holds and 'tween decks, all fore and aft. In steamers the bilges and limbers under engines and boilers are to be cleaned out, so as to allow these parts to be examined by the Surveyor. In water-ballast steamers the tanks are to be examined externally and, if the Surveyor deems it necessary, they are to be tested under the pressure due to the ballast-trim water-line, and sufficient ceiling removed to enable the Surveyor to satisfy himself of their tightness. In all cases the tanks are to be emptied, and examined inside. In all vessels any repairs that may be needed are to be done, and the vessel cleaned and painted as may be necessary.

Second Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

> A strake of ceiling must be lifted in the bilges to allow an examination of the condition of the iron surfaces there and of the cement.
>
> The windlass must be unhung when the main piece is of wood; and the chain cables must be ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water-line.

Third Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

> The whole of the close ceiling must be removed, and all the cement exposed and examined. The vessel must be cleaned and scaled, and, if the Surveyor deems it necessary, the plating and other parts must be drilled as he may direct, to ascertain the thickness. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water-line.

Fourth Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions:—

> The windlass, if the main piece is of wood, must be unhung, and the chain cables ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to the ballast-trim water-line.

Fifth Survey.

The vessel must be submitted to the same survey as before described for "Second Survey."

Sixth Survey or Special Survey.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions:—

> The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.
>
> A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

After a vessel has passed her sixth survey, and been approved by the Committee she must be submitted to the same series of surveys, commencing with the "First Survey," and at the same periodical intervals as before.

In steamers, whenever the engines or boilers are removed, a survey is to be held on the vessel's bottom in way thereof, and such repairs as are necessary must be effected before the engines or boilers are replaced.

The preceding rules for periodical surveys are not to limit the Surveyor's discretion, if, in his judgment, it is necessary to make a more complete examination at any time; and, before completing the report, the Surveyor must, at every periodical survey, satisfy himself that the vessel and her equipment are in a good and efficient condition.

The "Third Survey" must be complied with before the expiration of thirteen years from the date of launch for vessels with an A1* or **A1*** certificate, ten years for vessels with an A1 or **A1** certificate, and nine years for vessels with an A or **A** certificate; and the "Sixth Survey" before the expiration of twenty-six years from the date of launch for vessels with an A1* or **A1*** certificate, twenty years for vessels with an A1 or **A1** certificate, and eighteen years for vessels with an A or **A** certificate.

EXTRACTS FROM THE RULES of the late UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING).

EQUIPMENT FOR STEAM VESSELS.

Section 29.—The equipment of Anchors and Chain Cables and Hawsers to be in accordance with TABLE 14 for Steam Vessels (*see below*).

The tonnage regulating equipment is to be the gross register tonnage under upper deck, with the addition of three-tenths of the tonnage of erections above upper deck.

TABLE No. 14.—ANCHORS, CHAINS, AND HAWSERS FOR STEAM VESSELS.

VESSELS TONNAGE. *See Section* 29.	Anchors, with either Iron or Wood Stocks.								Stud-chain Cables.			Stream Chain.		Hawsers and Warps.				VESSELS TONNAGE. *See Section* 29.
	Number.			Weight.					Minimum Size.	Proved to Admiralty Test.	Length.			Tow Rope.	Hawsers.	Warps.	Length.	
	Bowers.	Stream.	Kedges.	Bowers. Without Stock.	Bowers. Admiralty Test.	Stream.	Kedge.	2nd Kedge.										
Tons. Tons.				Cwt.	Tons.	Cwt.	Cwt.	Cwt.	Inches.	Tons.	Fathoms.	Fatn.	Size.	Inches.	Inches.	Inches.	Fath.	Tons. Tons.
100 and under 150	2	1	...	3	4·9	1	...	...	$\frac{11}{16}$	8·1	120	45	$\frac{8}{16}$	$5\frac{1}{2}$	$3\frac{1}{2}$	...	90	100 and under 150
150 „ 188	2	1	1	4	6·4	$1\frac{3}{4}$	1	...	$\frac{13}{16}$	11·9	150	45	$\frac{9}{16}$	6	4	...	90	150 „ 188
188 „ 225	2	1	1	$5\frac{1}{4}$	7·6	2	1	...	$\frac{14}{16}$	13·8	165	45	$\frac{10}{16}$	6	4	...	90	188 „ 225
225 „ 263	2	1	1	6	8·2	$2\frac{1}{2}$	$1\frac{1}{4}$	...	$\frac{15}{16}$	15·8	165	45	$\frac{10}{16}$	$6\frac{1}{2}$	4	...	90	225 „ 263
263 „ 300	2	1	1	$7\frac{1}{4}$	9·5	$2\frac{3}{4}$	$1\frac{1}{4}$	...	1	18	165	45	$\frac{11}{16}$	7	5	...	90	263 „ 300
300 „ 375	3	1	1	$8\frac{1}{4}$	10·4	3	$1\frac{1}{2}$	...	$1\frac{1}{16}$	20·3	165	60	$\frac{11}{16}$	$7\frac{1}{2}$	$5\frac{1}{2}$	...	90	300 „ 375
375 „ 450	3	1	2	10	12·0	$4\frac{3}{4}$	$2\frac{1}{4}$	1	$1\frac{2}{16}$	22·8	195	60	$\frac{12}{16}$	8	6	...	90	375 „ 450
450 „ 525	3	1	2	12	13·9	5	$2\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{3}{16}$	25·4	195	60	$\frac{12}{16}$	$8\frac{1}{2}$	$6\frac{1}{2}$	...	90	450 „ 525
525 „ 600	3	1	2	$13\frac{1}{2}$	15·2	6	3	$1\frac{1}{2}$	$1\frac{4}{16}$	28·1	210	60	$\frac{13}{16}$	9	7	...	90	525 „ 600
600 „ 675	3	1	2	$15\frac{1}{4}$	16·7	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{5}{16}$	31	210	60	$\frac{13}{16}$	$9\frac{1}{2}$	7	4	90	600 „ 675
675 „ 750	3	1	2	$16\frac{3}{4}$	18·0	7	$3\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{6}{16}$	34	240	60	$\frac{14}{16}$	10	8	5	90	675 „ 750
750 „ 900	3	1	2	18	19·0	8	4	2	$1\frac{7}{16}$	37·2	240	60	$\frac{14}{16}$	10	8	5	90	750 „ 900
900 „ 1050	3	1	2	21	21·6	9	$4\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{8}{16}$	40·5	240	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	900 „ 1050
1050 „ 1200	3	1	2	$23\frac{1}{2}$	23·5	10	5	$2\frac{1}{2}$	$1\frac{9}{16}$	44	270	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	1050 „ 1200
1200 „ 1350	3	1	2	$25\frac{1}{2}$	25·2	$10\frac{1}{2}$	$5\frac{1}{4}$	$2\frac{3}{4}$	$1\frac{10}{16}$	47·5	270	75	1	10	$9\frac{1}{2}$	6	90	1200 „ 1350
1350 „ 1500	3	1	2	$27\frac{3}{4}$	26·9	11	$5\frac{1}{2}$	$2\frac{3}{4}$	$1\frac{11}{16}$	51·2	270	75	1	10	10	6	90	1350 „ 1500
1500 „ 1800	3	1	2	30	28·6	12	6	3	$1\frac{12}{16}$	55·1	270	75	$1\frac{1}{16}$	11	$10\frac{1}{2}$	$6\frac{1}{2}$	90	1500 „ 1800
1800 „ 2100	3	1	2	32	30·1	13	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{13}{16}$	59·1	270	75	$1\frac{1}{16}$	11	11	7	90	1800 „ 2100
2100 „ 2400	3	1	2	34	31·6	$13\frac{1}{2}$	$6\frac{3}{4}$	$3\frac{1}{4}$	$1\frac{14}{16}$	63·3	270	75	$1\frac{2}{16}$	11	11	7	90	2100 „ 2400
2400 „ 2700	3	1	2	$36\frac{1}{2}$	33·4	14	7	$3\frac{1}{2}$	$1\frac{15}{16}$	67·6	270	90	$1\frac{2}{16}$	12	12	8	90	2400 „ 2700
2700 „ 3000	3	1	2	38	34·5	$14\frac{1}{2}$	$7\frac{1}{4}$	$3\frac{1}{2}$	2	72	270	90	$1\frac{3}{16}$	12	12	8	90	2700 „ 3000
3000 „ 3450	3	1	2	40	35·7	15	$7\frac{1}{2}$	$3\frac{3}{4}$	$2\frac{1}{16}$	76·6	270	90	$1\frac{3}{16}$	12	12	8	90	3000 „ 3450
3450 „ 3900	3	1	2	41	37·0	16	8	$4\frac{1}{4}$	$2\frac{2}{16}$	81·3	300	90	$1\frac{3}{16}$	12	12	8	90	3450 „ 3900
3900 „ 4500	4	1	2	43	38·0	$17\frac{1}{2}$	$8\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{16}$	86·1	300	90	$1\frac{4}{16}$	12	12	9	90	3900 „ 4500
4500 „ 5250	4	1	2	45	39·2	19	$9\frac{1}{2}$	$4\frac{3}{4}$	$2\frac{4}{16}$	91·1	330	90	$1\frac{4}{16}$	12	12	9	90	4500 „ 5250
5250 „ 6000	4	1	2	47	41	21	10	5	$2\frac{5}{16}$	96	330	90	$1\frac{5}{16}$	12	12	9	90	5250 „ 6000

Anchors and Chains to be tested to Admiralty proof. A reduction of 15 per cent. will be allowed in the weight of the Third and Fourth Bower.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

STEEL MANUFACTURERS.

The following firms having applied to have the steel produced by them tested by a Surveyor to this Society and their mode of procedure reported upon, their applications have been complied with and the Surveyors' reports found satisfactory by the Committee.

Firms in the United Kingdom.

Acme Steel and Foundry Co., Shettleston, near Glasgow. (*Steel castings.*)

Allan, Edgar, & Co., Lim., Imperial Steel Works, Tinsley, Sheffield. (*Steel castings.*)

Armstrong (Sir W. G.), Whitworth & Co., Lim., Elswick, Northumberland, and Openshaw, Manchester. (*Steel castings.*)

Baird, Archibald, & Son, Lim., Hamilton, near Glasgow. (*Steel castings.*)

Barrow Hæmatite Steel Co., Lim., Barrow-in-Furness.

Beardmore, William, & Co., Lim., Steel Works, Rolling Mills and Foundry, Parkhead, Glasgow; and Steel Works and Rolling Mills, Mossend, Lanarkshire.

Bell Bros., Lim., Port Clarence, Middlesbro'-on-Tees.

Bessemer, H., & Co., Lim., Bessemer Works, Sheffield, Yorkshire; and Bolton, Lancashire.

Blackett, Hutton & Co., Cleveland Steel and Iron Works, Guisborough, Yorkshire. (*Steel castings.*)

Blaydon Iron Works (The), Blaydon-on-Tyne. (*Steel castings.*)

Bolckow, Vaughan & Co., Lim., Middlesbro'-on-Tees.

British Mannesmann Tube Co., Lim., Landore, S. Wales. (*Weldless rolled or drawn steel hollow pillars and davits.*)

Brown, John, & Co., Lim., Sheffield.

Brymbo (The) Steel & Ingot Iron Works, near Wrexham, Denbighshire. (*For bars only.*)

Butterley Co., Lim., Codnor Park, near Alfreton, Derbyshire.

Caledonian Steel Castings Co., Helen Street, Govan, Glasgow.

Cammell Laird & Co., Lim., Sheffield.

Cargo Fleet Iron Co., Lim., Cargo Fleet Iron Works, near Middlesbro'-on-Tees.

Carntyne Steel Castings Co., Moorpark, Renfrew. (*Steel castings.*)

Clydebridge Steel Co., Lim., Steel Works and Rolling Mills, Cambuslang, near Glasgow.

Coltness Iron Co., Lim., Melting Furnace and Foundry, Newmains, Lanarkshire.

Colville, David, & Sons, Lim., Steel Works and Rolling Mills (Dalzell Steel and Iron Works), Motherwell, Lanarkshire.

Consett Iron Co., Lim., Blackhill, Durham.

Darlington Forge Co., Lim., Darlington, co. Durham. (*Steel castings.*)

Dorman, Long & Co., Lim., Middlesbro'-on-Tees, and Port Clarence, co. Durham.

Dudley's (The Earl of) Round Oak Iron and Steel Works, Lim., Brierley Hill, Staffordshire (*Sections and Bars.*)

Dunlop, J., & Co. (1900), Lim., Steel Works and Rolling Mills, Calderbank, Lanarkshire.

Firth, Thomas, & Sons, Lim., Norfolk Works, Sheffield.

Frodingham Iron & Steel Co., Lim., Frodingham, near Doncaster, Yorkshire. (*Sections and Bars.*)

Glasgow Iron & Steel Co., Lim., Steel Works and Rolling Mills at Wishaw, Lanarkshire.

Glengarnock Iron and Steel Co., Lim., Glengarnock, Ayrshire. (*Sections and Bars.*)

Guest, Keen & Nettlefolds, Lim.,
Dowlais (Glamorgan) and Cardiff. (*Plates and Bars.*)
Castle Works, Tydu, near Newport, Mon. (*Rivet and Stay bars.*)
London Works, near Birmingham. (*Rivet bars only.*)
Hadfield's Steel Foundry Co., Lim., Sheffield. (*Steel castings.*)
Hardie & Gordon, Melting Furnaces and Foundry, Levenbank Foundry, Dalreoch, Dumbarton.
Jackson, P. R., & Co., Lim., Salford Rolling Mills, Manchester.
Jessop, W., & Sons, Lim., Brightside Works, Sheffield.
Jopling, E., & Sons, Pallion, Sunderland. (*Steel castings.*)
Lanarkshire Steel Co., Lim., Motherwell, Lanarkshire. (*Sections and Bars.*)
Lancashire & Yorkshire Railway Co., Horwich, Lancashire. (*Steel castings.*)
Leeds Forge Co., Lim., Leeds.
Lloyd, F. H., & Co., Lim., James Bridge, near Wednesbury, Staffordshire. (*Steel castings.*)
Lumb, James, & Sons, Lim., Elland, Yorkshire. (*Steel castings.*)
Monks, Hall & Co., Lim., Warrington. (*Rolling Mills for bars.*)
Motherwell Iron & Steel Co., Lim., Motherwell, Lanarkshire. (*Rolling mills for angles, and round and flat bars.*)
Newport Rolling Mills, Lim., Middlesbro'-on-Tees.
Osborn, S., & Co., Clyde Steel & Iron Works, Sheffield. (*Steel castings.*)
Palmers Shipbuilding & Iron Co., Lim., Jarrow-on-Tyne.
Park Gate Iron & Steel Co., Lim., Rotherham, Yorkshire.
Patent Shaft & Axletree Co., Lim., Wednesbury, Staffordshire.
Pather Iron & Steel Co., Lim., Wishaw, Lanarkshire. (*Rolling Mills.*)
Port Talbot Steel Co., Lim., Port Talbot, South Wales.
Raine & Co., Lim., Delta Iron & Steel Works, Derwenthaugh, Newcastle-on-Tyne. (*Rivet bars only.*)
Rennie's Steel Casting Co., Maukinfauld Road, Tollcross, Glasgow. (*Steel castings.*)
Renton & Fisher, Lim., Hopetoun Steel Works, Bathgate, N.B. (*Steel castings.*)
Richmond Iron & Steel Co., Richmond Iron Works, Stockton-on-Tees. (*Rolling Mills for Stay and Rivet bars.*)
Rogerson, John, & Co., Lim., Wolsingham, co. Durham. (*Steel castings.*)
Shaw, W., & Co., Middlesbro'-on-Tees. (*Steel castings.*)
Shelton Iron, Steel & Coal Co., Lim., Stoke-on-Trent.
Skinningrove Iron Co., Lim. (The), Skinningrove, Carlin How, R.S.O., Yorks. (*Steel ingots only.*)
Smith & McLean, Lim., Rolling Mills at Mossend and Gartcosh, Lanarkshire.
South Durham Steel & Iron Co., Lim., Stockton-on-Tees and West Hartlepool.
Spencer, John, & Sons, Lim., Newburn Steel Works, Newcastle-on-Tyne.
Springfield Steel Co., Lim., Melting Furnace and Foundry, 777, London Road, Glasgow.
Steel Company of Scotland, Lim., Steel Works, Rolling Mills and Foundry at Newton, Glasgow; and Steel Works and Rolling Mills at Blochairn, Glasgow.
Steel, Peech & Tozer, Lim., Sheffield. (*Rivet and Stay bars.*)
Stewarts & Lloyds, Lim. (Clydesdale Steel and Iron Works), Steel Works and Rolling Mills, Mossend, Lanarkshire.
" " " Sun Foundry, Coatbridge, Lanarkshire. (*Steel castings.*)
Stockton Steel Foundry Co., Lim., Stockton-on-Tees. (*Steel castings.*)
Swalwell Steel Works, co. Durham. (*Steel castings.*)
Taylor Bros., Leeds.
Towler, William, & Co., Lim., Globe Foundry, Leeds. (*Small steel castings.*)
Tyzack, Samuel, & Co., Lim., Monkwearmouth Iron & Steel Works, Sunderland. (*Sections and Bars.*)
Vickers, Lim., River Don Works, Sheffield; and Barrow-in-Furness.
Waverley Iron & Steel Co., Lim., Coatbridge, Lanarkshire. (*Steel angles and bars.*)
Weardale Steel, Coal & Coke Co., Lim., Spennymoor, co. Durham.
Wigan Coal & Iron Co., Lim., Wigan, Lancashire. (*Sections and Bars.*)
Willans & Robinson, Lim., Queen's Ferry, Flintshire. (*Steel ingots.*)

FOREIGN FIRMS.

Alphabetically Arranged.

In the following list the name of each works is followed by the place of residence of the Surveyor giving attendance thereat.

Acciaierie Italiane, Bolzaneto, Italy. (Genoa.)

Aciéries de Grenelle (E. Plichon), 56, Rue Lourmel, Paris. (*Steel castings.*) (Havre.)

Aciéries de la Louvière (Gustave Boël), La Louvière, Belgium. (*Sections and Rivet bars, and Steel castings.*) (Antwerp.)

Aciéries de Maromme (E. Breton), Maromme (Seine Inférieure), France. (*Steel castings.*) (Havre.)

Actien-Gesellschaft Charlottenhütte, Niederschelden (Kreis Siegen), Germany. (*Steel plates and ingots.*) (Düsseldorf.)

Actien-Gesellschaft der Dillinger Hüttenwerke, Dillingen-Saar (Rheinpreussen), Germany. (Düsseldorf.)

Aktiebolaget Bofors-Gullspång, Bofors, Sweden. (*Melting Furnaces and Foundry* at Bofors.) (Gothenburg.)

Aktiengesellschaft der Eisen-und Stahlwerke, vormals Georg Fischer, Schaffhausen, Switzerland. (*Steel castings.*) (Düsseldorf.)

Aktiengesellschaft Lauchhammer, Lauchhammer, Germany. (*Steel Foundry* at Gröditz.) (*Steel castings.*) (Düsseldorf.)

Alan Wood Iron & Steel Company, Conshohocken and Ivy Rock, Pa. (*Blooms, billets and thin plates.*) (Philadelphia.)

Althaus, Pletsch & Co., Attendorn, Westphalia, Germany. (*Rolling Mills.*) (Düsseldorf.)

American Bridge Co., Pencoyd Iron Works, Pencoyd, Pa., U.S.A. (*Sections, angles and bars.*) (Philadelphia.)

American Iron & Steel Manufacturing Co., Lebanon, Pa., U.S.A. (*Rolling Mills for bars only.*) (Baltimore.)

American Iron & Steel Manufacturing Co., Reading, Pa., U.S.A. (*Rolling Mills for bars only.*) (Philadelphia.)

Annener Gussstahlwerk, Annen, Westphalia, Germany. (*Steel castings.*) (Düsseldorf.)

Ansaldo, Gio., Armstrong & Co., Fonderie & Acciaierie, Cornigliano Ligure, Italy. (*Steel castings.*) (Genoa.)

Avesta Jernverks Aktiebolag, Avesta, Sweden. (Stockholm.)

Baldt Steel Co., New Castle, Delaware, U.S.A. (*Steel castings.*) (Philadelphia.)

Bergische Stahl-Industrie, Remscheid, Germany. (*Steel ingots and castings.*) (Düsseldorf.)

Bethlehem Steel Co., South Bethlehem, Philadelphia. (Philadelphia.)

Bismarckhütte (Bismarckhütte & Falvahütte), Bismarckhütte, Oberschlesien, Germany. (*Also steel castings, and weldless rolled or drawn steel hollow pillars and davits.*) (Vienna.)

Björneborgs Jernverks Aktiebolag, Björneborg, Sweden. (*Melting Furnaces and Forge.*) (Gothenburg.)

Blechwalzwerk Schulz Knaudt Actien Gesellschaft. (*Steel Works* at Angerort, Germany; *Rolling Mills* at Essen.) (Düsseldorf.)

Bleckmann, John E., Mürzzuschlag, Austria. (*Steel bars.*) (Vienna.)

Blohm & Voss, Hamburg, Germany. (*Steel castings.*) (Hamburg.)

Bochumer Verein für Bergbau & Gussstahlfabrication, Bochum, Germany. (*Steel castings.*) (Düsseldorf.)

Böhler, Gebr., & Co., Aktiengesellschaft, Vienna. (*Works* at Kapfenberg, Styria.) (*Steel castings.*) (Vienna.)

Borsig, A. (Berg und Hütten-Verwaltung), Borsigwerk, Oberschlesien, Germany. (*Also Steel castings.*) (Vienna.)

Bremerhütte Actien Gesellschaft, Weidenau, Siegen, Germany. (*Steel Works* at Geisweid. *Rolling Mills* at Weidenau.) (*Steel plates and ingots.*) (Düsseldorf.)

Burmeister & Wain's Maskin-og Skibsbyggeri, Aktieselskabet, Copenhagen. (*Steel ingots, forgings and castings.*) (Copenhagen.)

Cambria Steel Co., Johnstown, Pa., U.S.A. (Pittsburg.)

Carbon Steel Co., Pittsburg, Pa., U.S.A. (Pittsburg.)

Carnegie Steel Co. (Lim.), Pittsburg, Pa., U.S.A. (including the National Steel Co., and the American Steel Hoop Co.) (Pittsburg.)

Central Iron & Steel Co., Harrisburg, Pa., U.S.A. (*Rolling Mills.*) (Baltimore.)

Christiania Staalværk, Christiania. (*Steel castings.*) (Christiania.)

Compagnie des Forges de Chatillon, Commentry et Neuves-Maisons, France. (Marseilles.)

Compagnie des Hauts-Fourneaux, Forges et Aciéries de la Marine et d'Homecourt, St. Chamond, France. (Marseilles.)

Compagnie des Mines, Fonderies & Forges d'Alais, Tamaris Works, Alais, France. (*Bars and Sections.*) (Marseilles.)

Compagnie Générale des Aciers, Société Anonyme, Thy-le-Château, Belgium. (*Steel castings.*) (Antwerp.)

Crucible Steel Company of America, Park Works, Pittsburg, Pa., U.S.A. (Pittsburg.)

Deutsch Luxemburgische Bergwerks-und Hütten-Actien Gesellschaft, Abteilung Dortmunder Union, Dortmund, Germany. (*Also Steel castings.*) (Düsseldorf.)

Dorémieux Fils & Cie., St. Amand (Nord), France. (*Rolling Mills.*) (DUNKIRK.)

Düsseldorfer Eisen-und Draht-Industrie, Düsseldorf-Oberbilk, Germany. (DÜSSELDORF.)

Eisen und Stahlwerk Hoesch, Dortmund, Germany. (DÜSSELDORF.)

Eisenbahn-Bedarfs Actien Gesellschaft, Friedenshütte Oberschlesien, Germany. (VIENNA.)

Eisenhütte Holstein Actiengesellschaft, Rendsburg, Germany. (HAMBURG.)

Elektrizitäts-Aktien-Gesellschaft, vormals Kolben & Co., Prague-Vysocan, Bohemia. (*Steel castings.*) (VIENNA.)

Erie Forge Co., Erie, Pa., U.S.A. (*Steel ingots and forgings.*) (CLEVELAND, O.)

Fabrique de Fer de Maubeuge, Louvroil (Nord), France. (DUNKIRK.)

Federal Steel Co., Chester, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Ferriera di Bolzaneto, near Genoa. (*For plates up to* $\frac{3}{4}$ *in. thickness.*) (GENOA.)

Fonderia Milanese di Acciaio, Milan. (*Steel castings.*) (GENOA.)

Fonderies, Forges et Aciéries de St. Etienne, St. Etienne, France. (MARSEILLES.)

Fonderies d'Acier du Midi, Marseilles. (*Steel castings.*) (MARSEILLES.)

Forges de Clabecq, Clabecq, Belgium. (*Rolling Mills.*) (ANTWERP.)

Forges de la Loire et du Midi (Messrs. Marrel Frères) Rive de Gier, France. (MARSEILLES.)

Forges & Laminoirs de l'Alliance, Marchienne au Pont, Belgium. (*Rolling Mills.*) (ANTWERP.)

Forges et Laminoirs de St. Victor, Société Anonyme, Marchienne au Pont, Belgium. (*Steel bars.*) (ANTWERP.)

Ganz & Co., Ratibor, Silesia, Germany. (*Steel castings.*) (VIENNA.)

Geisweider Eisenwerke Actien Gesellschaft, Geisweid (Kreis Siegen), Germany. (DÜSSELDORF.)

Gelsenkirchener Bergwerks Actien Gesellschaft, Abteilung Aachener Hütten Verein, Rothe Erde, Aachen, Germany. (DÜSSELDORF.)

Gelsenkirchener Gussstahl und Eisenwerke, vormals Munscheid & Co., Gelsenkirchen, Germany. (*Steel castings.*) (DÜSSELDORF.)

Georgs-Marien Bergwerks-und Hütten-Verein, Osnabrück, Germany. (*Steel castings.*) (DÜSSELDORF.)

Gewerkschaft Deutscher Kaiser, Hamborn-Bruckhausen am Rhein, Germany. (DÜSSELDORF.)

Gewerkschaft Grillo, Funke & Co., Gelsenkirchen Schalke, Westphalia, Germany. (DÜSSELDORF.)

Glasgow Iron Co., Pottstown, Pa. (*Rolling Mills for plates.*) (PHILADELPHIA.)

Grafenberger Walzwerk, Düsseldorf-Grafenberg, Germany. (*Rolling Mills.*) (DÜSSELDORF.)

Gruson (Otto) & Co., Magdeburg-Buckau, Germany. (*Steel castings.*) (DÜSSELDORF.)

Gussstahl-Werk Witten, Witten a/d Ruhr, Germany. (DÜSSELDORF.)

Gutehoffnungshütte, Oberhausen, Rheinland, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Hagener Gussstahlwerke Actien Gesellschaft, Hagen, Westphalia, Germany. (*Steel castings.*) (DÜSSELDORF.)

Hahnsche Werke Actien Gesellschaft, Grossenbaum, near Duisburg, Germany. (*Broad flats and ingots.*) (DÜSSELDORF.)

Haniel & Lueg, Düsseldorf-Grafenberg, Germany. (*Steel castings.*) (DÜSSELDORF.)

Hauts-Fourneaux, Fonderies Forges & Laminoirs de Meurthe & Moselle (Mr. Fould-Dupont), Usines de Pompey, France. (DÜSSELDORF.)

Henschel & Sohn, Abteilung Henrichshütte, near Hattingen a/d Ruhr, Germany. (DÜSSELDORF.)

Holtzer, Jacob, & Co., Aciéries d'Unieux, Unieux (Loire), France. (*Steel castings.*) (MARSEILLES.)

Howaldtswerke, Kiel, Germany. (*Steel castings.*) (HAMBURG.)

Illinois Steel Co., Chicago, U.S.A. (PITTSBURG.)

Imperial Steel Works (The), Yawata, Japan. (NAGASAKI.)

Jaeger, G. & J., G.m.b.h., Elberfeld, Germany. (*Steel castings.*) (DÜSSELDORF.)

Japan Steel Works, Lim. (The), Muroran, Japan. (*Steel ingots and forgings.*) (NAGASAKI.)

Jones & Laughlin, Lim., Pittsburg, Pa., U.S.A. (PITTSBURG.)

Kawasaki Dockyard Co., Lim., Shiri-ike-mura, Hiogo, Japan. (*Steel castings.*) (KOBE.)

Kohlswa Jernverks Aktiebolag. (*Melting Furnaces and Foundry* at Kohlswa, Sweden.) (STOCKHOLM.)

Krainische Industrie-Gesellschaft, Assling-Hütte, Carniole, Austria. (VIENNA.)

Krupp, Fried., Actien Gesellschaft, Stahlwerk Annen, Annen, Westphalia, Germany. (*Steel castings.*) (DÜSSELDORF.)

Krupp, Fried., Actien Gesellschaft, Essen, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Krupp, Fried., Actien Gesellschaft, Grusonwerk, Magdeburg, Germany. (*Steel castings.*) (DÜSSELDORF.)

Krupp, Fried., Actien Gesellschaft—Friedrich Alfred Hütte, Rheinhausen — Friemersheim, Germany. (*Bars and Sections only.*) (DÜSSELDORF.)

Lackawanna Steel Co., Buffalo, N.Y., U.S.A. (PITTSBURG.)

Lindener Eisen- & Stahlwerke Aktien-Gesellschaft, Hannover-Linden, Germany. (*Steel castings.*) (DÜSSELDORF.)

Luken's Iron and Steel Company, Coatesville, Pennsylvania, U.S.A. (PHILADELPHIA.)

Luxemburger Bergwerks-und Saarbrücker Eisenhütten-Actien Gesellschaft, Saarbrücken - Burbach, Germany. (DÜSSELDORF.)

Magyar Kiralyi Allamvasutak Gepgyaranak. (*Rolling Mills* at Zolyom-Brezo; *Rolling Mills and Steel Foundry* at Diosgyor, Hungary.) (VIENNA.)

Malleable Iron Fittings Co., Branford, Conn. (*Steel castings.*) (BOSTON, MASS.)

Mannesmannröhrenwerke, Abteilung Saarbrücker Gussstahlwerke, Saarbrücken - Burbach, Germany. (*Steel castings.*) (DÜSSELDORF.)

Mannesmannröhrenwerke, Düsseldorf, Remscheid und Bous, Germany. (*Weldless rolled or drawn steel hollow pillars and davits.*) (DÜSSELDORF.)

Michaelsen, Hermann, Eisen-und Stahl-Giesserei, Erdmannstrasse, 23, Altona-Ottensen, Germany. (*Steel castings.*) (HAMBURG.)

Midvale Steel Co., Philadelphia, Pa., U.S.A. (PHILADELPHIA.)

Motala Verkstads Nya Aktiebolag, Motala Verkstad, Sweden. (*Melting Furnaces, Rolling Mills and Forge.*) (GOTHENBURG.)

Neuberg Steel Works, Neuberg, Styria. (VIENNA.)

Nicopol-Marioopol Mining & Metallurgical Co., Sartana, South Russia. (ODESSA.)

Nova Scotia Steel & Coal Co. (Lim.) (*Steel Works* at North Sydney, C.B., and *Rolling Mills* at New Glasgow, N.S.) (*Bars and Sections only.*) (HALIFAX, N.S.)

Oberbilker Stahlwerk Actien Gesellschaft, Düsseldorf-Oberbilk, Germany. (DÜSSELDORF.)

Oberschlesische Eisen-Industrie Actien Gesellschaft, Baildonhütte, near Kattowitz, Germany. (VIENNA.)

Oesterreichisch-Alpine Montangesellschaft, Donawitz, near Leoben. (VIENNA.)

Oesterreichisch-Alpine Montangesellschaft, Zeltweg, Austria. (VIENNA.)

Oesterreichische Berg und Hüttenwerks, Gesellschaft, Teschen, Silesia. (VIENNA.)

Oliver Iron & Steel Co., Pittsburg, Pa., U.S.A. (*Rolling Mills for bars.*) (PITTSBURG.)

Penn Steel Casting & Machine Co., Chester, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Pennsylvania Steel Co., Steelton, near Harrisburg, Pa. (BALTIMORE.)

"Phœnix" Actien Gesellschaft für Bergbau-und Hütten Betrieb, Ruhrort, Germany. (DÜSSELDORF.)

"Phœnix" Actien Gesellschaft für Bergbau-und Hütten Betrieb, Abteilung Düsseldorfer Röhren und Eisen-Walzwerke, Düsseldorf-Oberbilk, Germany. (DÜSSELDORF.)

"Phœnix" Actien Gesellschaft für Bergbau-und Hütten Betrieb, Abteilung Hoerder Verein, Hoerde, Westphalia, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Phœnix Iron Works, Phœnixville, Pa., U.S.A. (PHILADELPHIA.)

Pittsburg Steel Foundry, Glassport, Pa., U.S.A. (*Steel castings and Ingots.*) (PITTSBURG.)

Poldihütte Tiegelgussstahlfabrik, Kladno, near Prague. (VIENNA.)

Prager Eisen Industrie Gesellschaft und Böhmische Montan Gesellschaft, Kladno, near Prague. (VIENNA.)

Press und Walzwerk Actien Gesellschaft, Düsseldorf-Reisholz, Germany. (DÜSSELDORF.)

Rheinische Bergbau und Hüttenwesen Actien Gesellschaft. (*Steel Works* at Duisburg-Hochfeld, Germany. *Rolling Mills* at Düsseldorf-Oberbilk.) (DÜSSELDORF.)

Rheinische Stahlwerke, Ruhrort, Germany. (DÜSSELDORF.)

Rheinische Stahlwerke, Abteilung Duisburger Eisen-und Stahlwerke, Duisburg, Germany. (DÜSSELDORF.)

Rimamurany-Salgo-Tarjaner Eisenwerks Actien-Gesellschaft, Budapest. (*Steel Works* in Ozd, Hungary.) (VIENNA.)

Rombacher Hüttenwerke, Rombach (Lothringen), Germany. (*Bars and Sections only.*) (DÜSSELDORF.)

Sandvikens Jernverks Aktiebolag, Sandviken, Sweden. (*Steel ingots, forgings, and steel tubes.*) (STOCKHOLM.)

Schichau, F., Elbing, West Prussia, Germany. (*Steel castings.*) (DANZIG.)

Schneider & Co., Creusot. (MARSEILLES.)

Skodawerke Actien Gesellschaft, Pilsen, Bohemia. (*Steel castings.*) (VIENNA.)

Sociedad Altos Hornos de Vizcaya, Bilbao. (BILBAO.)

Sociedad Anonima Fabrica de San Francisco del Desierto, Bilbao. (BILBAO.)

Sociedad Metalurgica Duro-Felguera, La Felguera, Asturias, Spain. (BILBAO.)

Società degli Alti Forni, Fonderie ed Acciaierie di Terni. Works at Terni. (NAPLES.)

Società Ligure Metallurgica, Lim., Sestri Ponente, Italy. (GENOA.)

Società Siderurgica di Savona (late Tardy & Benech) Savona. (GENOA.)

Société Anonyme Boulonneries & Laminoirs Gilson, La Croyère (Bois d'Haine), Belgium. (*Rolling Mills for Sections.*) (ANTWERP.)

Société Anonyme d'Athus-Grivegnée, Grivegnée, near Liége, Belgium. (*Bars, Sections, and Thin Plates.*) (ANTWERP.)

Société Anonyme d'Escaut & Meuse, Anzin (Nord), France. (DUNKIRK.)

Société Anonyme d'Espérance, Longdoz, Liège. (*Rolling Mills.*) (ANTWERP.)

Société Anonyme de la Fabrique de Fer de Charleroi, Belgium. (*Rolling Mills.*) (ANTWERP.)

Société Anonyme des Aciéries d'Angleur, Renory & Tilleur-lez-Liége, Belgium. (ANTWERP.)

Société Anonyme des Aciéries & Fonderies d'Art de Haine St. Pierre et Métallurgique Lilloise, Haine St. Pierre, Belgium. (*Steel castings.*) (ANTWERP); and Lesquin-lez-Lille (Nord), France. (*Steel castings.*) (DUNKIRK.)

Société Anonyme des Aciéries & Forges de Firminy, Firminy (Loire), France. (*Steel castings.*) (MARSEILLES.)

Société Anonyme des Aciéries Nantaises, Nantes. (*Steel castings.*) (NANTES.)

Société Anonyme des Fonderies et Aciéries de Hirson, Hirson, France. (*Steel castings.*) (HAVRE.)

Société Anonyme des Forges de la Providence, Hautmont (Nord), France. (DUNKIRK.)

Société Anonyme des Forges de Vireux-Molhain, Vireux-Molhain, Ardennes, France. (*Bars and Sections only.*) (ANTWERP.)

Société Anonyme des Forges et Fonderies de Montataire, Montataire, France. (HAVRE.)

Société Anonyme des Forges et Laminoirs de Baume, Haine St. Pierre, Belgium. (*Rolling Mills for Bars and Sections.*) (ANTWERP.)

Société Anonyme des Forges et Tôleries Liégeoises, Jupille-lez-Liège. (ANTWERP.)

Société Anonyme des Hauts-Fourneaux, Fonderies & Forges de Franche-Comté, Besançon (Doubs), France. (MARSEILLES.)

Société Anonyme des Hauts-Fourneaux Forges et Aciéries de Denain & d'Anzin, Denain (Nord), France. (DUNKIRK.)

Société Anonyme des Tôleries de Louvroil (Nord), France. (DUNKIRK.)

Société Anonyme des Usines du Phénix, Châtelineau, Belgium. (*Rolling Mills.*) (ANTWERP.)

Société Anonyme Usines & Aciéries Leonard-Giot, Marchienne-au-Pont, Belgium. (*Steel castings.*) (ANTWERP.)

Société des Aciéries de Longwy, Mont St. Martin (Meurthe & Moselle), France. (DÜSSELDORF.)

Société Française des Aciéries de l'Union, Hautmont (Nord), France. (*Steel castings.*) (DUNKIRK.)

Société Française pour la Fabrication des Tubes, Louvroil (Nord), France. (*Steel ingots and steel tubes.*) (DUNKIRK.)

Société John Cockerill, Seraing, near Liège, Belgium. (ANTWERP.)

Stahlwerk Oeking, Actien Gesellschaft, Düsseldorf-Lierenfeld, Germany. (*Steel castings.*) (DÜSSELDORF.)

Steirische Gussstahlwerke Danner & Co., Iudenburg, Styria. (*Steel castings.*) (VIENNA.)

Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden. (*Steel Works* at Domnarfvet.) (*Sections of all sizes and plates up to* $\frac{5}{8}$ *in. thick.*) (STOCKHOLM.)

Strömmens Verksted, near Christiania. (*Steel castings.*) (CHRISTIANIA.)

Strömsnäs Jernverks Aktiebolag, Degerfors, Sweden (*Melting Furnaces and Rolling Mills.*) (GOTHENBURG.)

Sumitomo Steel Works, Osaka, Japan. (*Steel castings.*) (KOBE.)

Surahammars Bruks Aktiebolag, Surahammar, Sweden. (*Forge and Rolling Mills.*) (STOCKHOLM.)

Ternitzer Stahl und Eisenwerk, Ternitz, Austria. (*Steel bars and castings.*) (VIENNA.)

Thyssen & Co., Mülheim, a/d. Ruhr, Germany. (DÜSSELDORF.)

Tidewater Steel Company, Chester, Pennsylvania, U.S.A. (PHILADELPHIA.)

Ungarische Berg-und Hüttenwerke und Domänen der priv. österr.-ung. Staats-Eisenbahn-Gesellschaft, Budapest. (*Steel Works* in Resicza.) (VIENNA.)

Usines & Aciéries Allard, Société Anonyme, Mont-sur-Marchienne, near Charleroi, Belgium. (*Steel castings.*) (ANTWERP.)

Usines de Court St. Etienne (Emile Henricot), Belgium. (*Steel castings.*) (ANTWERP.)

Usines Métallurgiques de Hainaut, Couillet and La Louvière, Belgium. (ANTWERP.)

Usines Métallurgiques de la Basse Loire, Trignac, near St. Nazaire. (NANTES.)

Vereinigte Königs- & Laurahütte Act. Ges., für Bergbau & Hüttenbetrieb, Königshütte & Laurahütte, Oberschlesien, Germany. (VIENNA.)

Vereinigte Stahlwerke van der Zypen und Wissener Eisenhütten Actien Gesellschaft, Köln-Deutz, Germany. (*Bars and Sections.*) (DÜSSELDORF.)

Wendel & Cie., les Petits-Fils de F^ois^ de, Hayingen, Lothringen, Germany. (DÜSSELDORF.)

Westfälische Stahlwerke, Bochum, Germany. (*Steel Foundry and Rolling Mills.*) (DÜSSELDORF.)

Witkowitzer Bergbau & Eisenhütten Gewerkschaft, Witkowitz, Mähren. (VIENNA.)

Worth Bros. Steel Works, Coatesville, Pa. (PHILADELPHIA.)

FOREIGN FIRMS.

ARRANGED ACCORDING TO SURVEYING DISTRICTS.

ANTWERP.

Aciéries de la Louvière (Gustave Boël), La Louvière, Belgium. (*Sections and Rivet bars, and Steel castings.*)

Compagnie Générale des Aciers Société Anonyme, Thy-le-Château, Belgium. (*Steel castings.*)

Forges de Clabecq, Brussels, Belgium. (*Rolling Mills.*)

Forges & Laminoirs de l'Alliance, Marchienne-au-Pont, Belgium. (*Rolling Mills.*)

Forges & Laminoirs de St. Victor, Société Anonyme, Marchienne-au-Pont, Belgium. (*Steel bars.*)

Société Anonyme Boulonneries & Laminoirs Gilson, La Croyère (Bois d'Haine), Belgium. (*Rolling Mills for Sections.*)

Société Anonyme d'Athus-Grivegnée, Grivegnée, near Liège, Belgium. (*Bars, Sections, and Thin Plates.*)

Société Anonyme d'Espérance, Longdoz, Liège. (*Rolling Mills.*)

Société Anonyme de la Fabrique de Fer de Charleroi, Belgium. (*Rolling Mills.*)

Société Anonyme des Aciéries d'Angleur, Renory & Tilleur-lez-Liège, Belgium.

Société Anonyme des Aciéries & Fonderies d'Art de Haine St. Pierre et Métallurgique Lilloise, Haine St. Pierre, Belgium. (*Steel castings.*)

Société Anonyme des Forges de Vireux-Molhain, Vireux-Molhain, Ardennes, France. (*Bars and Sections only.*)

Société Anonyme des Forges et Laminoirs de Baume, Haine St. Pierre, Belgium. (*Rolling Mills for Bars and Sections.*)

Société Anonyme des Forges et Tôleries Liègeoises, Jupille-lez-Liège, Belgium.

Société Anonyme des Usines du Phénix, Châtelineau, Belgium. (*Rolling Mills.*)

Société Anonyme Usines & Aciéries Leonard-Giot, Marchienne-au-Pont, Belgium. (*Steel castings.*)

Société John Cockerill, Seraing, near Liège.

Usines & Aciéries Allard, Société Anonyme, Mont-sur-Marchienne, near Charleroi, Belgium. (*Steel castings.*)

Usines de Court St. Etienne (Emile Henricot), Belgium. (*Steel castings.*)

Usines Métallurgiques de Hainaut, Couillet and La Louvière, Belgium.

BALTIMORE, MD.

American Iron & Steel Manufacturing Co., Lebanon, Pa., U.S.A. (*Rolling Mills for bars only.*)

Central Iron & Steel Co., Harrisburg, Pa., U.S.A. (*Rolling Mills.*)

Pennsylvania Steel Co., Steelton, Harrisburg, Pa., U.S.A.

BILBAO.

Sociedad Altos Hornos de Vizcaya, Bilbao.

Sociedad Anonima Fabrica de San Francisco del Desierto, Bilbao.

Sociedad Metalurgica Duro-Felguera, La Felguera, Asturias, Spain.

BOSTON, MASS.

Malleable Iron Fittings Co., Branford, Conn., U.S.A. (*Steel castings.*)

CHRISTIANIA.

Christiania Staalværk. (*Steel castings.*)

Strömmens Verksted, near Christiania. (*Steel castings.*)

CLEVELAND, O.

Erie Forge Co., Erie, Pa., U.S.A. (*Steel ingots and forgings.*)

COPENHAGEN.

Burmeister & Wain's Maskin-og Skibsbyggeri, Aktie-selskabet, Copenhagen. (*Steel ingots, forgings and castings.*)

DANZIG.

Schichau, F., Elbing, West Prussia. (*Steel castings.*)

DUNKIRK.

Dorémieux Fils & Cie., St. Amand (Nord), France (*Rolling Mills.*)

Fabrique de Fer de Maubeuge, Louvroil (Nord), France.

Société Anonyme d'Escaut & Meuse, Anzin (Nord), France.

Société Anonyme des Aciéries & Fonderies d'Art de Haine St. Pierre et Métallurgique Lilloise, Lesquin-lez-Lille (Nord), France. (*Steel castings.*)

Société Anonyme des Forges de la Providence, Hautmont (Nord), France.

Société Anonyme des Hauts-Fourneaux Forges et Aciéries de Denain & d'Anzin, Denain (Nord), France.

Société Anonyme des Tôleries de Louvroil (Nord), France.

Société Française des Aciéries de l'Union, Hautmont (Nord), France. (*Steel castings.*)

Société Française pour la Fabrication des Tubes, Louvroil (Nord), France. (*Steel ingots and steel tubes.*)

DÜSSELDORF.

Actien-Gesellschaft Charlottenhütte, Niederschelden (Kreis Siegen), Germany. (*Steel plates and ingots.*)

Actien-Gesellschaft der Dillinger Hüttenwerke, Dillingen-Saar (Rheinpreussen), Germany.

Aktiengesellschaft der Eisen-und Stahlwerke, vormals Georg Fischer, Schaffhausen, Switzerland. (*Steel castings.*)

Aktiengesellschaft Lauchhammer, Lauchhammer, Germany. (*Steel Foundry* at Gröditz.) (*Steel castings.*)

Althaus, Pletsch & Co., Attendorn, Westphalia, Germany. (*Rolling Mills.*)

Annener Gussstahlwerk, Annen, Westphalia, Germany. (*Steel castings.*)

Bergische Stahl-Industrie, Remscheid, Germany. (*Steel ingots and castings.*)

Blechwalzwerk Schulz Knaudt Actien Gesellschaft, (*Steel Works* at Angerort, Germany; *Rolling Mills* at Essen.)

Bochumer Verein für Bergbau & Gussstahlfabrication, Bochum, Germany. (*Steel castings.*)

Bremerhütte Actien Gesellschaft, Weidenau, Siegen, Germany. (*Steel Works* at Geisweid. *Rolling Mills* at Weidenau.) (*Steel plates and ingots.*)

Deutsch Luxemburgische Bergwerks-und Hütten-Actien Gesellschaft, Abteilung Dortmunder Union, Dortmund, Germany. (*Also Steel castings.*)

Düsseldorfer Eisen-und Draht-Industrie, Düsseldorf-Oberbilk, Germany.

Eisen und Stahlwerk Hoesch, Dortmund, Germany.

Geisweider Eisenwerke Actien Gesellschaft, Geisweid (Kreis Siegen), Germany.

Gelsenkirchener Bergwerks Actien Gesellschaft, Abteilung Aachener Hütten Verein, Rothe Erde, Aachen, Germany.

Gelsenkirchener Gussstahl und Eisenwerke, vormals Munscheid & Co., Gelsenkirchen, Germany. (*Steel castings.*)

Georgs-Marien Bergwerks- und Hütten-Verein, Osnabrück, Germany (*Steel castings.*)

Gewerkschaft Deutscher Kaiser, Hamborn-Bruckhausen am Rhein, Germany.

Gewerkschaft Grillo, Funke & Co., Gelsenkirchen-Schalke, Westphalia, Germany.

Grafenberger Walzwerk, Düsseldorf - Grafenberg, Germany. (*Rolling Mills.*)

Gruson (Otto) & Co., Magdeburg-Buckau, Germany. (*Steel castings.*)

Gussstahl-Werk Witten, Witten a/d Ruhr, Germany.

Gutehoffnungshütte, Oberhausen, Rheinland, Germany. (*Also Steel castings.*)

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DÜSSELDORF—*continued.*

Hagener Gussstahlwerke Actien Gesellschaft, Hagen, Westphalia, Germany. (*Steel castings.*)

Hahnsche Werke Actien Gesellschaft, Grossenbaum, near Duisburg, Germany. (*Broad flats and ingots.*)

Haniel & Lueg, Düsseldorf-Grafenberg, Germany. (*Steel castings.*)

Hauts-Fourneaux, Fonderies, Forges & Laminoirs de Meurthe & Moselle (Mr. Fould-Dupont), Usines de Pompey, France.

Henschel & Sohn, Abteilung Henrichshütte, near Hattingen a/d Ruhr, Germany.

Jaeger, G. & J., G.m.b.h., Elberfeld, Germany. (*Steel castings.*)

Krupp, Fried., Actien Gesellschaft, Stahlwerk Annen, Annen, Westfalen, Germany. (*Steel castings.*)

Krupp, Fried., Actien Gesellschaft, Essen, Germany. (*Also Steel castings.*)

Krupp, Fried., Actien Gesellschaft, Grusonwerk, Magdeburg, Germany. (*Steel castings.*)

Krupp, Fried., Actien Gesellschaft—Friedrich Alfred Hütte, Rheinhausen — Friemersheim, Germany. (*Bars and Sections only.*)

Lindener Eisen- & Stahlwerke Aktien- Gesellschaft, Hannover-Linden, Germany. (*Steel castings.*)

Luxemburger-Bergwerks und Saarbrücker Eisenhütten-Actien-Gesellschaft, Saarbrücken-Burbach, Germany.

Mannesmannröhrenwerke, Abteilung Saarbrücker Gussstahlwerke, Saarbrücken-Burbach, Germany. (*Steel castings.*)

Mannesmannröhrenwerke, Düsseldorf, Remscheid und Bous, Germany. (*Weldless rolled or drawn Steel hollow pillars and davits.*)

Oberbilker Stahlwerk Actien Gesellschaft, Düsseldorf-Oberbilk, Germany.

"Phœnix" Actien Gesellschaft für Bergbau-und Hütten Betrieb, Ruhrort, Germany.

"Phœnix" Actien Gesellschaft für Bergbau-und Hütten Betrieb, Abteilung Düsseldorfer Röhren und Eisen-Walzwerke, Düsseldorf-Oberbilk, Germany.

"Phœnix" Actien Gesellschaft für Bergbau-und Hütten Betrieb, Abteilung Hoerder Verein, Hoerde, Westphalia, Germany. (*Also Steel castings.*)

Press und Walzwerk Actien Gesellschaft, Düsseldorf-Reisholz, Germany.

Rheinische Bergbau und Hüttenwesen Actien Gesellschaft. (*Steel Works* at Duisburg-Hochfeld, Germany; *Rolling Mills* at Düsseldorf-Oberbilk.)

Rheinische Stahlwerke, Ruhrort, Germany.

Rheinische Stahlwerke, Abteilung Duisburger Eisen und Stahlwerke, Duisburg, Germany.

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DÜSSELDORF—*continued.*

Rombacher Hüttenwerke, Rombach (Lothringen), Germany. (*Bars and Sections only.*)

Société des Aciéries de Longwy, Mont St. Martin (Meurthe & Moselle), France.

Stahlwerk Oeking Actien Gesellschaft, Düsseldorf-Lierenfeld, Germany. (*Steel castings.*)

Thyssen & Co., Mülheim, a.d. Ruhr, Germany.

Vereinigte Stahlwerke van der Zypen und Wissener Eisenhütten Actien Gesellschaft, Köln-Deutz, Germany. (*Bars and Sections.*)

Wendel & Cie., les Petits-Fils de Fois de Hayingen, Lothringen, Germany.

Westfälische Stahlwerke, Bochum, Westphalia, Germany. (*Steel Foundry and Rolling Mills.*)

GENOA.

Acciaierie Italiane, Bolzaneto, Italy.

Ansaldo, Gio., Armstrong & Co., Fonderie & Acciaierie, Cornigliano Ligure, Italy. (*Steel castings.*)

Ferriera di Bolzaneto, near Genoa. (*For plates up to $\frac{3}{4}$ in. thickness.*)

Fonderia Milanese di Acciaio, Milan. (*Steel castings.*)

Società Ligure Metallurgica (Lim.), Sestri Ponente, Italy.

Società Siderurgica di Savona (late Tardy & Benech), Savona.

GOTHENBURG.

Aktiebolaget Bofors-Gullspång, Bofors, Sweden. (*Melting Furnaces and Foundry* at Bofors.)

Björneborgs Jernverks Aktiebolag, Björneborg, Sweden. (*Melting Furnaces and Forge.*)

Strömsnäs Jernverks Aktiebolag, Degerfors, Sweden. (*Melting Furnaces and Rolling Mills.*)

Motala Verkstads Nya Aktiebolag, Motala Verkstad, Sweden. (*Melting Furnaces, Rolling Mills and Forge.*)

HALIFAX, N.S.

Nova Scotia Steel & Coal Co. (Lim.) (*Steel Works* at North Sydney, C.B., *and Rolling Mills* at New Glasgow, N.S.) (*Bars and Sections only.*)

HAMBURG.

Blohm & Voss. (*Steel castings.*)

Eisenhütte Holstein Actiengesellschaft, Rendsburg, Germany.

Howaldtswerke, Kiel. (*Steel castings.*)

Michaelsen, Hermann, Eisen-und Stahl-Giesserei, Erdmannstrasse, 23, Altona-Ottensen. (*Steel castings.*)

HAVRE.

Aciéries de Grenelle (E. Plichon), 56, Rue Lourmel, Paris. (*Steel castings.*)

Aciéries de Maromme (E. Breton), Maromme (Seine Inférieure), France. (*Steel castings.*)

Société Anonyme des Fonderies et Aciéries de Hirson, Hirson, France. (*Steel castings.*)

Société Anonyme des Forges et Fonderies de Montataire, Montataire, France.

KOBE.

Kawasaki Dockyard Co., Lim., Shiri-ike-mura, Hiogo, Japan. (*Steel castings.*)

Sumitomo Steel Works, Osaka, Japan. (*Steel castings.*)

MARSEILLES.

Compagnie des Forges de Chatillon, Commentry et Neuves-Maisons, France.

Compagnie des Hauts-Fourneaux, Forges et Aciéries de la Marine et d'Homecourt, St. Chamond, France.

Compagnie des Mines, Fonderies & Forges d'Alais, Tamaris Works, Alais, France. (*Bars and Sections.*)

Fonderies, Forges et Aciéries de St. Etienne, St. Etienne, France.

Fonderies d'Acier du Midi, Marseilles. (*Steel castings.*)

Forges de la Loire et du Midi (Messrs. Marrel Frères), Rive de Gier, France.

Holtzer, Jacob, & Cie., Aciéries d'Unieux, Unieux, (Loire), France. (*Steel castings.*)

Schneider & Co., Creusot.

Société Anonyme des Aciéries & Forges de Firminy, Firminy (Loire), France. (*Steel castings.*)

Société Anonyme des Hauts-Fourneaux, Fonderies & Forges de Franche-Comté, Besançon (Doubs), France.

NAGASAKI.

The Imperial Steel Works, Yawata, Japan.

The Japan Steel Works, Lim., Muroran, Japan. (*Steel ingots and forgings.*)

NANTES.

Société Anonyme des Aciéries Nantaises, Nantes. (*Steel castings.*)

Usines Métallurgiques de la Basse Loire, Trignac, near St. Nazaire.

NAPLES.

Società degli Alti Forni, Fonderie ed Acciaierie di Terni. Works at Terni.

ODESSA.

Nicopol-Marioopol Mining & Metallurgical Co., Sartana, South Russia.

PHILADELPHIA, PA.

Alan Wood Iron & Steel Company, Conshohocken and Ivy Rock, Pa., U.S.A. (*Blooms, billets and thin plates.*)

American Bridge Co., Pencoyd Iron Works, Pencoyd, Pa., U.S.A. (*Sections, angles and bars.*)

American Iron & Steel Manufacturing Co., Reading, Pa., U.S.A. (*Rolling Mills for bars only.*)

Baldt Steel Co., New Castle, Delaware. (*Steel castings.*)

Bethlehem Steel Co., South Bethlehem, Philadelphia, Pa., U.S.A.

Federal Steel Co., Chester, Pa., U.S.A. (*Steel castings.*)

Glasgow Iron Co., Pottstown, Pa., U.S.A. (*Rolling Mills for plates.*)

Luken's Iron & Steel Company, Coatesville, Pa., U.S.A.

Midvale Steel Co., Philadelphia, Pa., U.S.A.

Penn Steel Casting & Machine Co., Chester, Pa., U.S.A. (*Steel castings.*)

Phœnix Iron Works, Phœnixville, Pa., U.S.A.

Tidewater Steel Company, Chester, Pa., U.S.A.

Worth Bros. Steel Works, Coatesville, Pa., U.S.A.

PITTSBURG, PA.

Cambria Steel Co., Johnstown, Pa., U.S.A.

Carbon Steel Co., Pittsburg, Pa., U.S.A.

Carnegie Steel Co., Lim., Pittsburg, Pa., U.S.A. (including the National Steel Co., and the American Steel Hoop Co.).

Crucible Steel Company of America, Park Works, Pittsburg, Pa., U.S.A.

Illinois Steel Co., Chicago, U.S.A.

Jones & Laughlin (Lim.), Pittsburg, Pa., U.S.A.

Lackawanna Steel Co., Buffalo, N.Y., U.S.A.

Oliver Iron & Steel Co., Pittsburg, Pa., U.S.A.

Pittsburg Steel Foundry, Glassport, Pa., U.S.A. (*Castings and Ingots.*)

STOCKHOLM.

Avesta Jernverks Aktiebolag, Avesta, Sweden.

Kohlswa Jernverks Aktiebolag. (*Melting Furnaces and Foundry* at Kohlswa, Sweden.)

Sandvikens Jernverks Aktiebolag, Sandviken, Sweden. (*Steel ingots, forgings, and steel tubes.*)

Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden. (*Steel Works* at Domnarfvet.) (*Sections of all sizes and plates up to ¾ ins. thick.*)

Surahammars Bruks Aktiebolag, Surahammar, Sweden. (*Forge and Rolling Mills.*)

VIENNA.

Bismarckhütte (Bismarckhütte and Falvahütte), Bismarckhütte, Oberschlesien, Germany. (*Also steel castings, and weldless rolled or drawn steel hollow pillars and davits.*)

Bleckmann, John E., Mürzzuschlag, Austria. (*Steel bars.*)

Böhler, Gebr., & Co., Aktiengesellschaft, Vienna. (*Works* at Kapfenberg, Styria.) (*Steel castings.*)

Borsig, A. (Berg und Hütten-Verwaltung), Borsigwerk, Oberschlesien, Germany. (*Also Steel castings.*)

Eisenbahn-Bedarfs Actien Gesellschaft, Friedenshütte Oberschlesien, Germany.

Elektrizitäts-Aktien-Gesellschaft, vormals Kolben & Co., Prague-Vysocan, Bohemia. (*Steel castings.*)

Ganz & Co., Ratibor, Silesia, Germany. (*Steel castings.*)

Krainische Industrie - Gesellschaft, Assling - Hütte, Carniole, Austria.

Magyar Kiralyi Allamvasutak Gepgyaranak. (*Rolling Mills* at Zolyom-Brezo ; *Rolling Mills and Steel Foundry* at Diosgyor, Hungary.)

Neuberg Steel Works, Neuberg, Styria.

Oberschlesische Eisen-Industrie Actien Gesellschaft, Baildonhütte, near Kattowitz, Germany.

Oesterreichisch-Alpine Montangesellschaft, Donawitz, near Leoben.

Oesterreichisch-Alpine Montangesellschaft, Zeltweg, Austria.

Oesterreichische Berg und Hüttenwerks Gesellschaft, Teschen, Silesia.

Poldihütte Tiegelgussstahlfabrik, Kladno, near Prague.

Prager Eisen Industrie Gesellschaft und Böhmische Montan Gesellschaft, Kladno, near Prague.

Rimamurany - Salgo - Tarjaner Eisenwerks Actien-Gesellschaft, Budapest. (*Steel Works* in Ozd, Hungary.)

Skodawerke - Actien Gesellschaft, Pilsen, Bohemia. (*Steel castings.*)

Steirische Gussstahlwerke Danner & Co., Iudenburg, Styria. (*Steel castings.*)

Ternitzer Stahl und Eisenwerk, Ternitz, Austria. (*Steel bars and castings.*)

Ungarische Berg-und Hüttenwerke und Domänen per priv. österr.-ung. Staats - Eisenbahn - Gesellschaft, Budapest. (*Steel Works* in Resicza.)

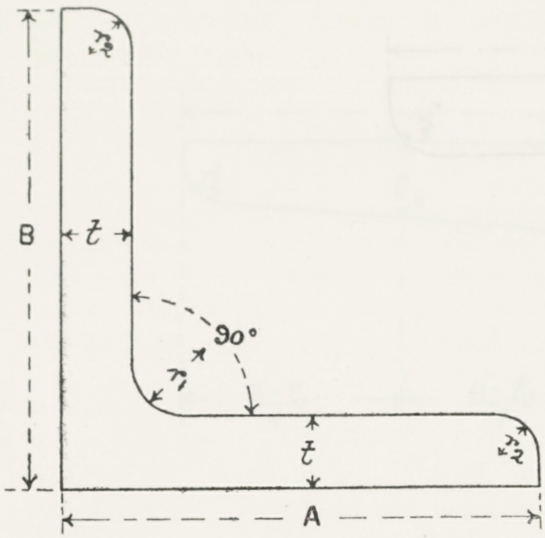
Vereinigte Königs- & Laurahütte Act. Ges., für Bergbau & Hüttenbetrieb, Königshütte & Laurahütte, Oberschlesien, Germany.

Witkowitzer Bergbau & Eisenhütten Gewerkschaft, Witkowitz, Mähren.

(*Revised, November,* 1911.)

BRITISH STANDARD SECTIONS.

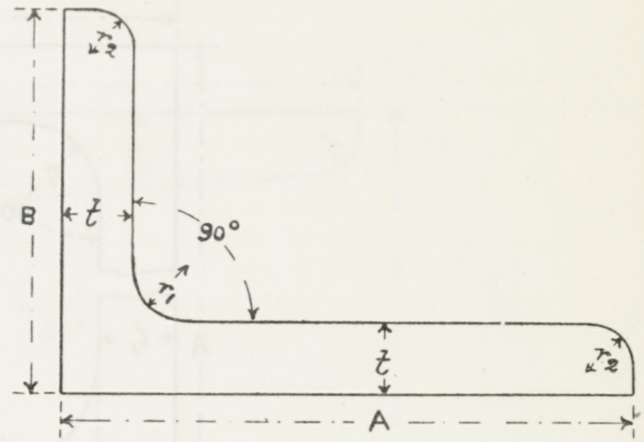
EQUAL ANGLES.



Size.	Thickness at Correct Standard Profile.			Minimum thickness rolled.	Maximum thickness rolled.	Radii.	
A × B	Minimum.	Mean.	Maximum.			Root.	Toe.
	t	t	t			r_1	r_2
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
1 × 1	·125	—	·250	·125	·300	·175	·125
$1\frac{1}{4} \times 1\frac{1}{4}$	·125	—	·250	·125	·300	·200	·150
$1\frac{1}{2} \times 1\frac{1}{2}$	·125	—	·250	·125	·350	·200	·150
$1\frac{3}{4} \times 1\frac{3}{4}$	·175	—	·300	·175	·375	·225	·150
2 × 2	·175	—	·300	·175	·400	·250	·175
$2\frac{1}{4} \times 2\frac{1}{4}$	·175	—	·300	·175	·450	·250	·175
$2\frac{1}{2} \times 2\frac{1}{2}$	·250	·375	·500	·200	·500	·275	·200
$2\frac{3}{4} \times 2\frac{3}{4}$	·250	·375	·500	·225	·525	·275	·200
3 × 3	·250	·375	·500	·250	·525	·300	·200
$3\frac{1}{2} \times 3\frac{1}{2}$	·300	·425	·500	·275	·575	·325	·225
4 × 4	·300	·425	·500	·300	·625	·350	·250
$4\frac{1}{2} \times 4\frac{1}{2}$	·375	—	·500	·325	·650	·400	·275
5 × 5	·375	—	·500	·350	·700	·425	·300
6 × 6	·450	—	·625	·425	·775	·475	·325
7 × 7	·500	—	·675	·475	·850	·550	·375
8 × 8	·550	—	·750	·550	·950	·600	·425

UNEQUAL ANGLES.

(NOTE;—The Section marked thus * is additional to the British Standard Sections.)

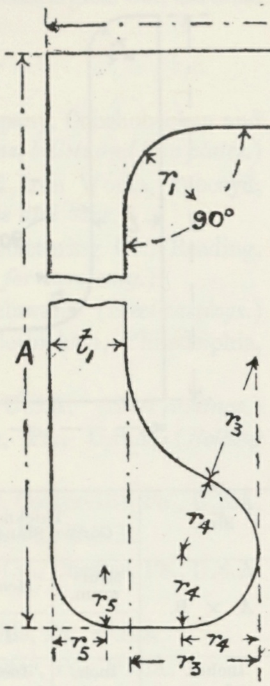


Size.	Thickness at Correct Standard Profile.			Minimum thickness rolled.	Maximum thickness rolled.	Radii.	
A × B.	Minimum.	Mean.	Maximum.			Root.	Toe.
	t	t	t			r_1	r_2
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
$1\frac{1}{4} \times 1$	·125	—	·250	·125	·300	·175	·125
$1\frac{1}{2} \times 1\frac{1}{4}$	·125	—	·250	·125	·325	·200	·150
$1\frac{3}{4} \times 1\frac{1}{2}$	·175	—	·300	·150	·350	·225	·150
$2 \times 1\frac{1}{2}$	·175	—	·300	·175	·375	·225	·150
$2\frac{1}{2} \times 2$	·175	—	·300	·175	·450	·250	·175
3 × 2	·250	·375	·500	·200	·500	·275	·200
$3 \times 2\frac{1}{2}$	·250	·375	·500	·225	·525	·275	·200
$3\frac{1}{2} \times 2\frac{1}{2}$	·250	·375	·500	·250	·525	·300	·200
$3\frac{1}{2} \times 3$	·250	·375	·500	·250	·550	·325	·225
$4 \times 2\frac{1}{2}$	·250	·375	·500	·250	·550	·325	·225
4 × 3	·300	·425	·500	·275	·575	·325	·225
$4 \times 3\frac{1}{2}$	.300	·425	·500	·275	·600	·350	·250
$4\frac{1}{2} \times 3$	·300	·425	·500	·275	·600	·350	·250
$4\frac{1}{2} \times 3\frac{1}{2}$	·300	·425	·500	·300	·625	·350	·250
5 × 3	·300	·425	·500	·300	·625	·350	·250
$5 \times 3\frac{1}{2}$	·375	—	·500	·325	·625	·375	·250
5 × 4	·375	—	·500	·325	·650	·400	·275
$5\frac{1}{2} \times 3$	·375	—	·500	·325	·625	·375	·250
$5\frac{1}{2} \times 3\frac{1}{2}$	·375	—	·500	·325	·650	·400	·275
6 × 3	·375	—	·500	·350	·675	·400	·275
$6 \times 3\frac{1}{2}$	·375	—	·500	·350	·675	·400	·275
6 × 4	·375	—	·500	·350	·700	·425	·300
*$6\frac{1}{2} \times 3$	·375	—	·500	·350	·700	·425	·300
$6\frac{1}{2} \times 3\frac{1}{2}$	·375	—	·500	·350	·700	·425	·300
$6\frac{1}{2} \times 4\frac{1}{2}$	—	·550	—	·400	·750	·450	·325
$7 \times 3\frac{1}{2}$	—	·525	—	·375	·725	·425	·300
7 × 4	—	·550	—	·400	·750	·450	·325
$8 \times 3\frac{1}{2}$	—	·575	—	·400	·750	·475	·325
8 × 4	—	·625	—	·425	·775	·475	·325
9 × 4	—	·650	—	·450	·825	·500	·350
10 × 4	—	·675	—	·475	·850	·550	·375

BRITISH STANDARD SECTIONS.

BULB ANGLES.

(NOTE :—The Section marked thus * is additional to the British Standard Sections

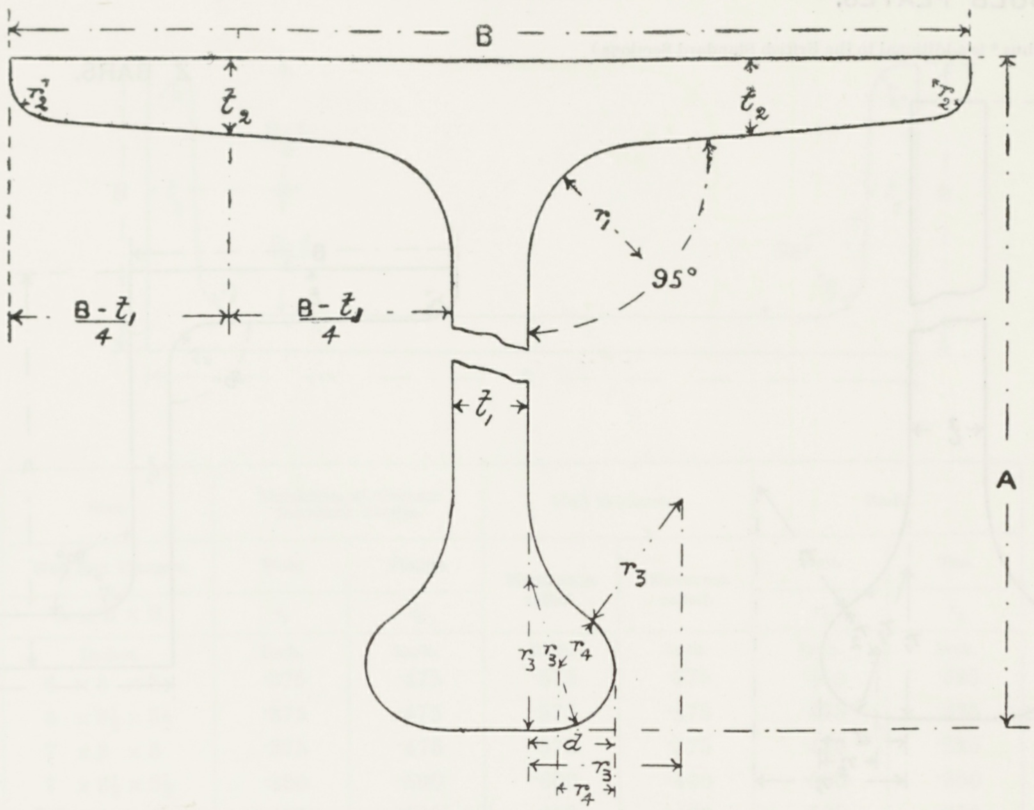


Size.	Thickness at Correct Standard Profile.		Web thickness.		Radii.				
	Web	Flange.	Maximum rolled.	Minimum rolled.					
A × B	t_1	t_2			r_1	r_2	r_3	r_4	r_5
Inches.	Inch.		Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
5 × 3	·325		·525	·325	·350	·250	·600	·350	·300
5½ × 3	·350		·550	·350	·375	·250	·650	·375	·325
6 × 3	·375		·575	·375	·400	·275	·675	·400	·325
6 × 3½	·375		·575	·375	·400	·275	·675	·400	·325
6½ × 3	·375		·575	·375	·425	·275	·700	·425	·350
6½ × 3½	·400		·600	·400	·425	·275	·700	·425	·350
7 × 3	·400		·600	·400	·450	·300	·750	·450	·375
7 × 3½	·425		·625	·425	·450	·300	·750	·450	·375
7½ × 3	·425		·625	·425	·475	·325	·800	·475	·400
7½ × 3½	·425		·625	·425	·475	·325	·800	·475	·400
8 × 3	·425		·625	·425	·500	·325	·825	·500	·400
8 × 3½	·450		·650	·450	·500	·325	·825	·500	·400
8½ × 3	·450		·650	·450	·525	·350	·850	·525	·425
8½ × 3½	·475		·675	·475	·525	·350	·850	·525	·425
9 × 3	·475		·675	·475	·550	·350	·900	·550	·450
9 × 3½	·475		·675	·475	·550	·350	·900	·550	·450
9½ × 3½	·500		·700	·500	·550	·375	·950	·550	·475
10 × 3½	·525		·725	·525	·575	·400	·975	·575	·500
10½ × 3½	·525		·725	·525	·575	·400	·975	·575	·500
11 × 3½	·550		·750	·550	·625	·425	1·050	·625	·525
*11½ × 3½	·575		·775	·575	·650	·450	1·100	·650	·550
12 × 3½	·575		·775	·575	·675	·450	1·125	·675	·550
12 × 4	·600		·800	·600	·675	·450	1·125	·675	·550

Where the thickness of Bulb Angle is greater than the Standard thickness, the flange and web will not be of the same thickness; generally for each ·05 inch increase in the thickness of the web the thickness of the flange will be increased ·025 inch.

BRITISH STANDARD SECTIONS.

BULB TEES.



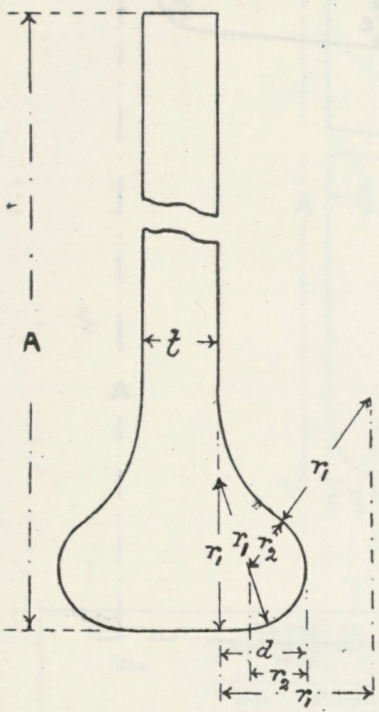
Size.	Thickness at correct Standard profile.		Web thickness.			Radii.			
	Web.	Flange.	Maximum rolled.	Minimum rolled.					
A × B	t_1	t_2			d	r_1	r_2	r_3	r_4
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
7 × 5	·425	·425	·500	·350	·450	·600	·200	·800	·300
8 × 5½	·450	·450	·525	·375	·500	·675	·225	·900	·325
9 × 5½	·475	·500	·550	·400	·575	·750	·250	1·000	·375
10 × 6	·500	·550	·575	·425	·625	·825	·275	1·100	·400
11 × 6½	·550	·600	·625	·475	·675	·900	·300	1·200	·450
12 × 6½	·575	·650	·650	·500	·725	·975	·325	1·300	·475

The standard thickness of flange of Bulb Tees is to be measured at a distance half way between the extreme edges of the flanges and the nearer side of the web.

BRITISH STANDARD SECTIONS.

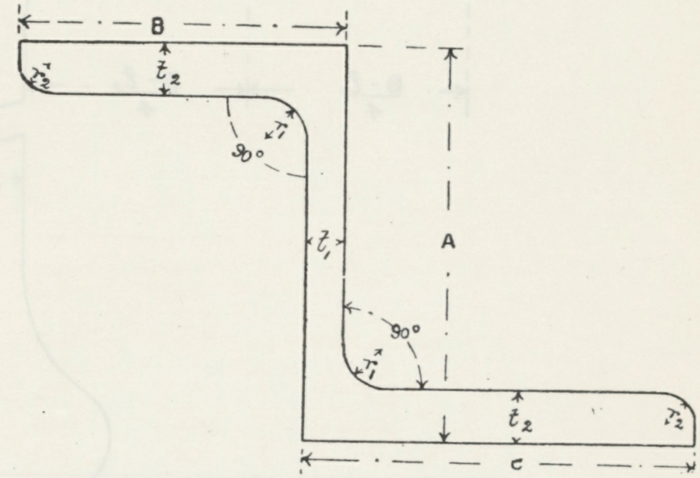
BULB PLATES.

(NOTE:—The Section marked thus * is additional to the British Standard Sections.)



Size.	Thickness at Correct Standard Profile.	Thickness.			Radii.	
A	t	Maximum rolled.	Minimum rolled.	d	r_1	r_2
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
*5	·250	·350	·200	·350	·550	·200
6	·300	·400	·250	·400	·700	·250
7	·350	·450	·275	·450	·800	·300
8	·400	·525	·325	·500	·900	·325
9	·450	·575	·350	·575	1·000	·375
10	·500	·625	·375	·625	1·100	·400
11	·550	·700	·425	·675	1·200	·450
12	·600	·750	·450	·725	1·300	·475

Z BARS.



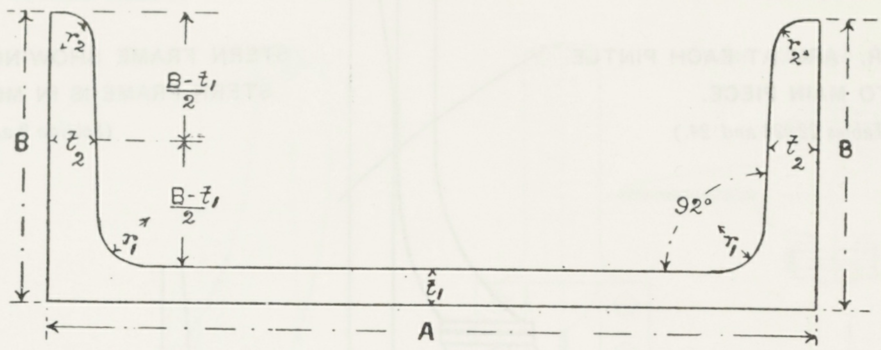
Size.	Thickness at Correct Standard Profile.		Web thickness.		Radii.	
Web and Flanges.	Web.	Flanges.	Maximum rolled.	Minimum rolled.	Root.	Toe.
A × B × C	t_1	t_2			r_1	r_2
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
$5 \times 3 \times 3$	·350	·450	·550	·350	·375	·250
$6 \times 3\frac{1}{2} \times 3\frac{1}{2}$	·375	·475	·575	·375	·425	·300
$7 \times 3\frac{1}{2} \times 3\frac{1}{2}$	·400	·500	·600	·400	·450	·300
$8 \times 3\frac{1}{2} \times 3\frac{1}{2}$	·425	·525	·625	·425	·450	·325
$9 \times 3\frac{1}{2} \times 3\frac{1}{2}$	·450	·550	·650	·450	·475	·350
$10 \times 3\frac{1}{2} \times 3\frac{1}{2}$	·475	·575	·675	·475	·500	·350

When the thickness of Zed bar is greater than the Standard thickness, the increase in thickness of flanges and web will not be the same; generally, for each ·05 inch increase the thickness of the web, the flange will be increased ·025 inch.

BRITISH STANDARD SECTIONS.

CHANNELS.

(NOTE:—The Sections marked thus * are additional to the British Standard Sections.)



Size.	Thickness at Correct Standard Profile.		Web thickness.		Radii.	
Web and Flanges.	Web.	Flange.	Maximum rolled.	Minimum rolled.	Root.	Toe.
A × B × B	t_1	t_2			r_1	r_2
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
6 × 3 × 3	·375	·475	·575	·375	·475	·325
6 × 3½ × 3½	·375	·475	·575	·375	·475	·325
7 × 3 × 3	·375	·475	·575	·375	·475	·325
7 × 3½ × 3½	·400	·500	·600	·400	·500	·350
*7½ × 3 × 3	·400	·500	·600	·400	·500	·350
*7½ × 3½ × 3½	·400	·500	·600	·400	·500	·350
*8 × 3 × 3	·400	·500	·600	·400	·500	·350
8 × 3½ × 3½	·425	·525	·625	·425	·525	·375
8 × 4 × 4	·450	·550	·650	·450	·550	·375
*8½ × 3 × 3	·425	·525	·625	·425	·525	·375
*8½ × 3½ × 3½	·450	·550	·650	·450	·550	·375
9 × 3½ × 3½	·450	·550	·650	·450	·550	·375
9 × 4 × 4	·475	·575	·675	·475	·575	·400
*9½ × 3½ × 3½	·450	·550	·650	·450	·550	·375
10 × 3½ × 3½	·475	·575	·675	·475	·575	·400
10 × 4 × 4	·475	·575	·675	·475	·575	·400
*10½ × 3½ × 3½	·475	·575	·675	·475	·575	·400
11 × 3½ × 3½	·475	·575	·675	·475	·575	·400
11 × 4 × 4	·500	·600	·700	·500	·600	·425
*11½ × 3½ × 3½	·500	·600	·700	·500	·600	·425
12 × 3½ × 3½	·500	·600	·700	·500	·600	·425
12 × 4 × 4	·525	·625	·725	·525	·625	·425
*15 × 4 × 4	·525	·625	·725	·525	·625	·425

The Standard thickness of flanges of Channel bar is to be measured at distances half-way between the extreme edges of the flanges and the nearer side of the web.

The web of Channel bars can vary in thickness between the limits shown in the Table, but the thickness of flange remains constant.

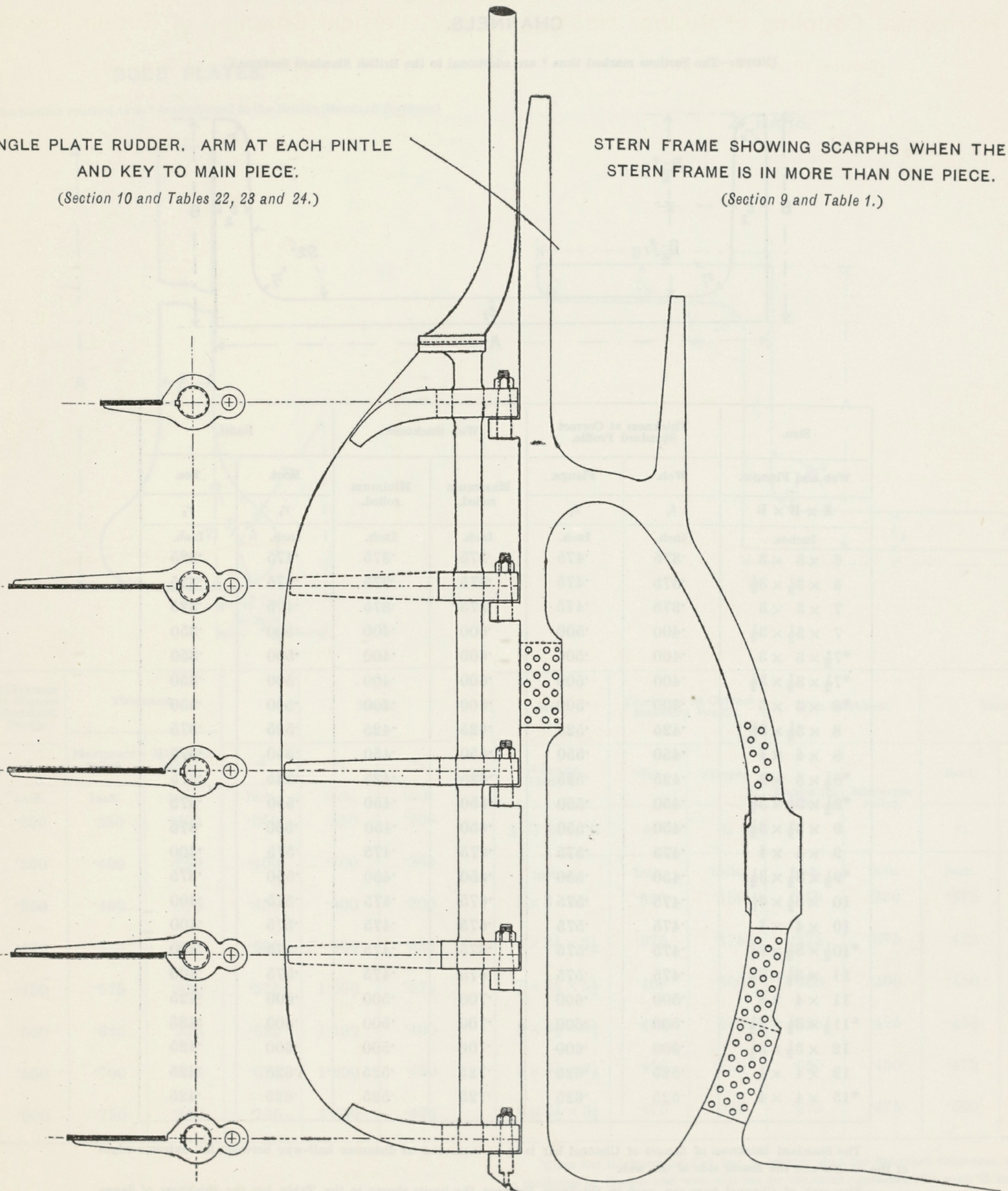
SINGLE PLATE RUDDER AND STERN FRAME.

SINGLE PLATE RUDDER. ARM AT EACH PINTLE AND KEY TO MAIN PIECE.

(Section 10 and Tables 22, 23 and 24.)

STERN FRAME SHOWING SCARPHS WHEN THE STERN FRAME IS IN MORE THAN ONE PIECE.

(Section 9 and Table 1.)

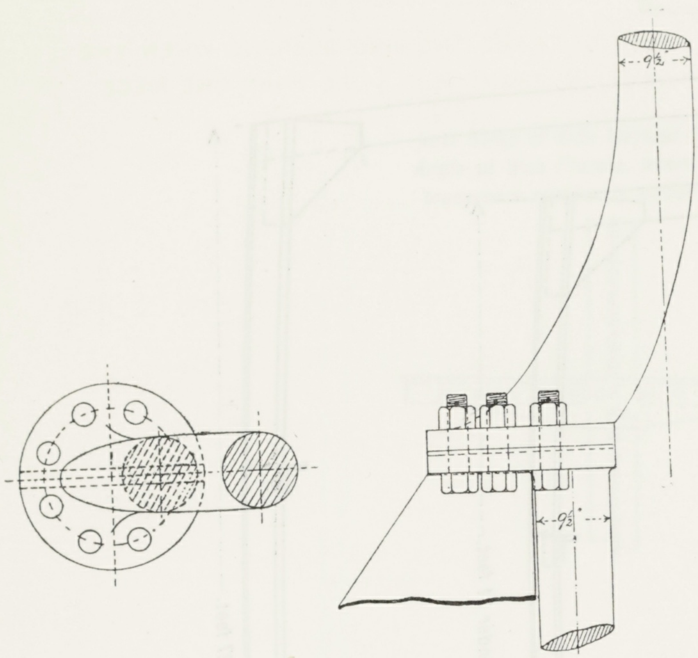


COUPLINGS OF RUDDER HEADS.

Horizontal Coupling of Rudder Head.

(Section 10 and Table 23.)

Rudder Head $9\frac{1}{2}$ inches diameter

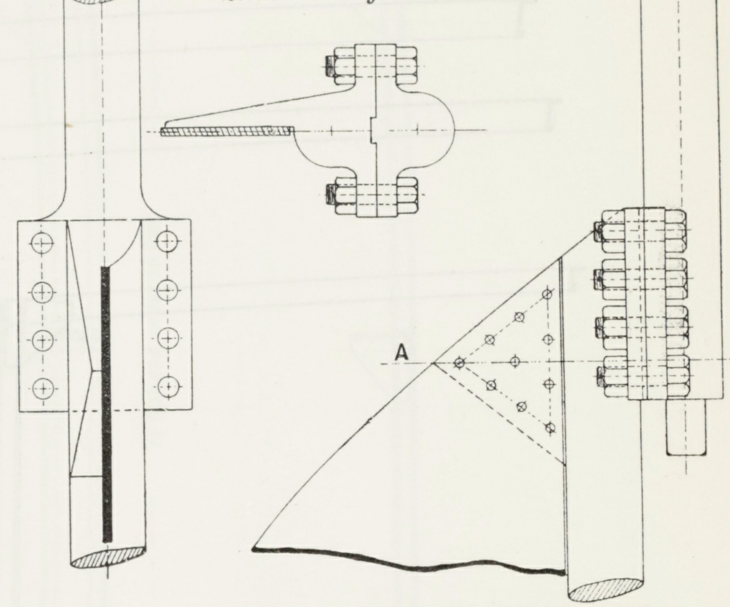


Vertical Coupling of Rudder Head.

(Section 10 and Table 23.)

Rudder Head $9\frac{1}{2}$ inches diameter.

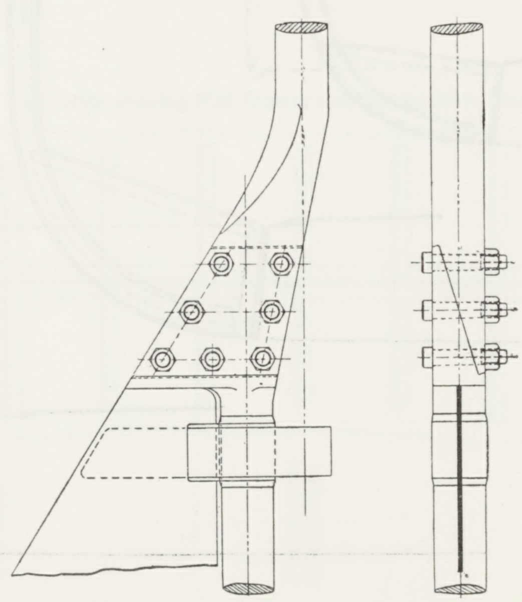
Section through A.B.



Scarphed Coupling of Rudder Head.

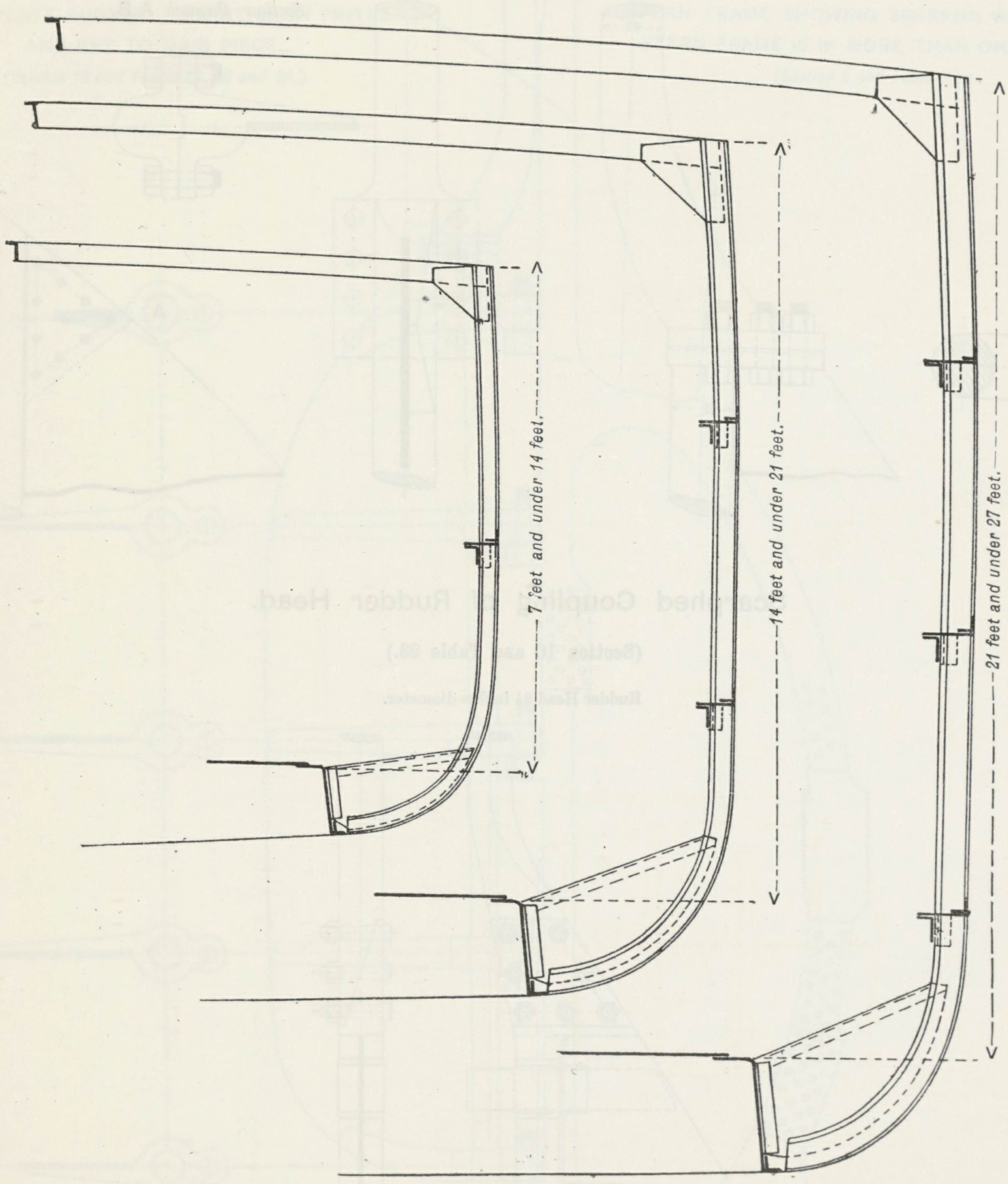
(Section 10 and Table 23.)

Rudder Head $9\frac{1}{2}$ inches diameter.



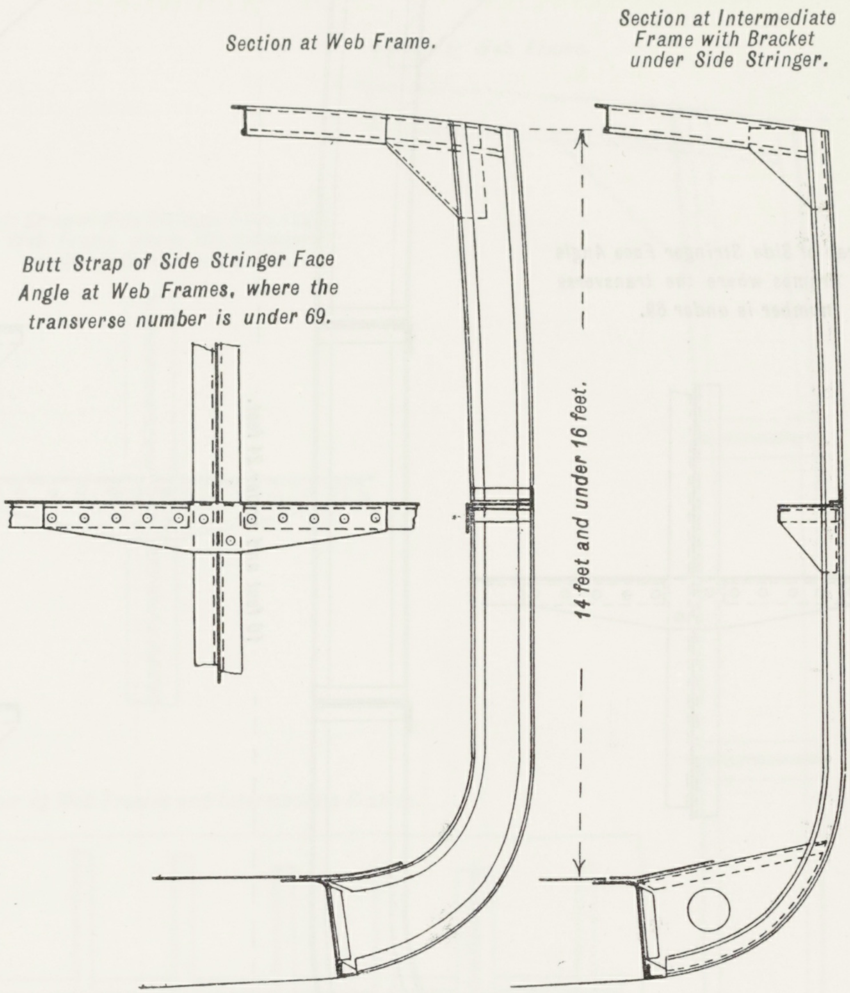
ARRANGEMENT OF SIDE STRINGERS.

(Section 15 and Tables 2, 3 & 7.)

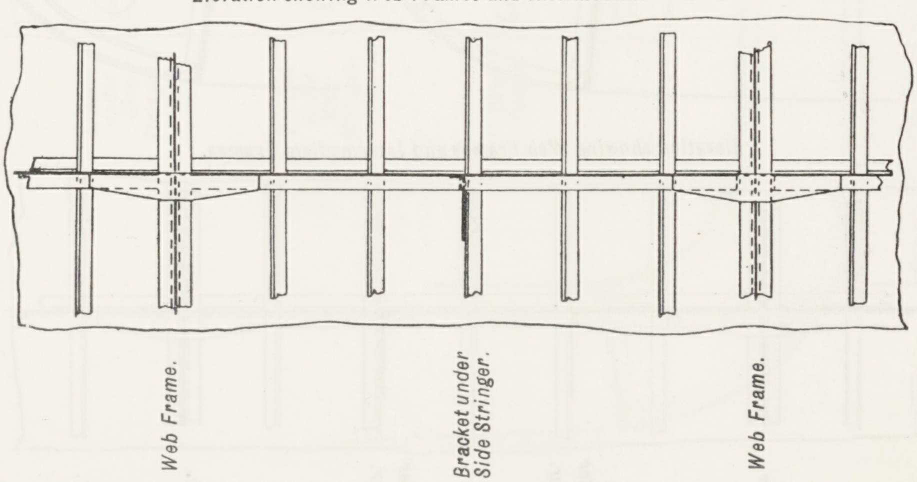


ARRANGEMENT OF WEB FRAMES AND SIDE STRINGERS.

(Section 13 and Table 5.)

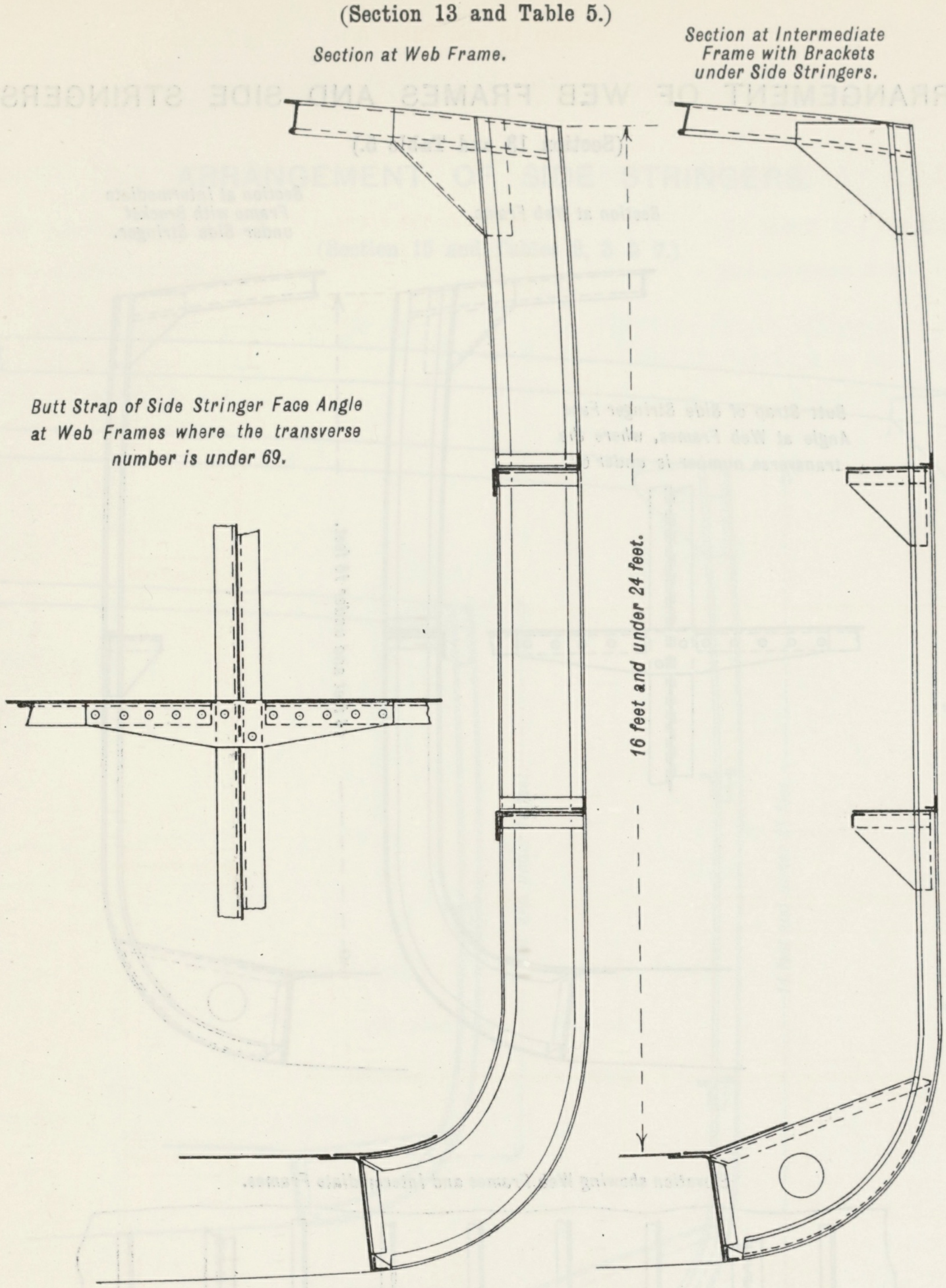


Elevation showing Web Frames and Intermediate Frames.

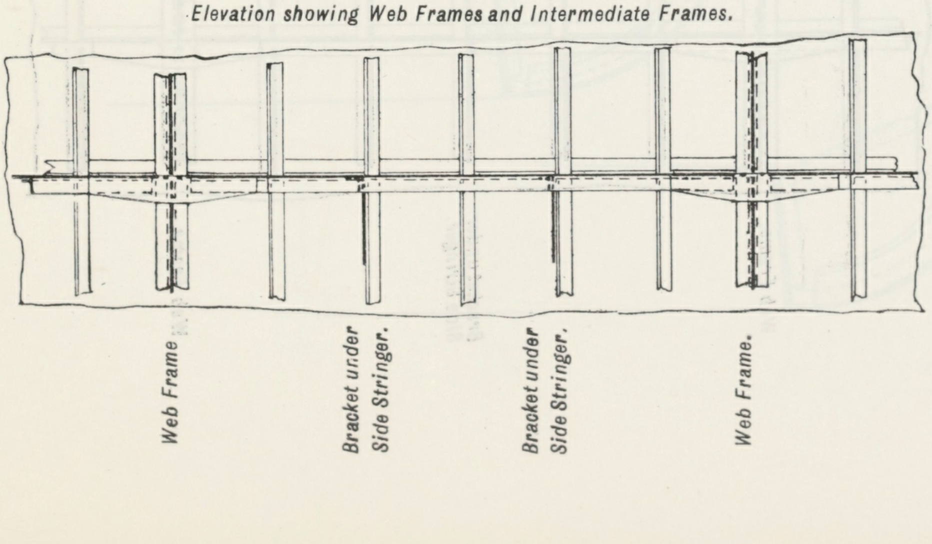


ARRANGEMENT OF WEB FRAMES AND SIDE STRINGERS.

(Section 13 and Table 5.)

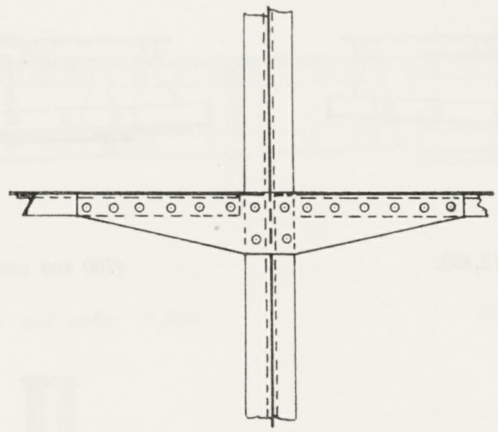


Elevation showing Web Frames and Intermediate Frames.

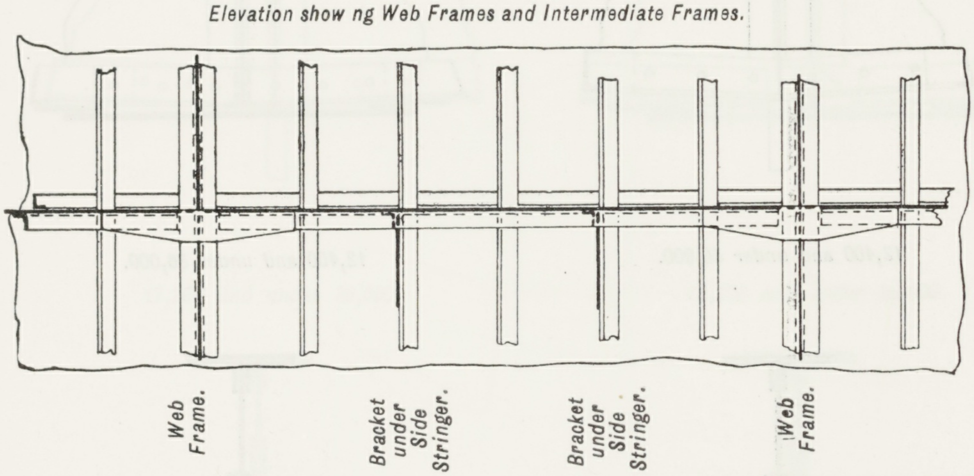


(Section 13 and Table 5.)

Butt Strap of Side Stringer Face Angle at Web Frame where the transverse number is 69 and under 111.

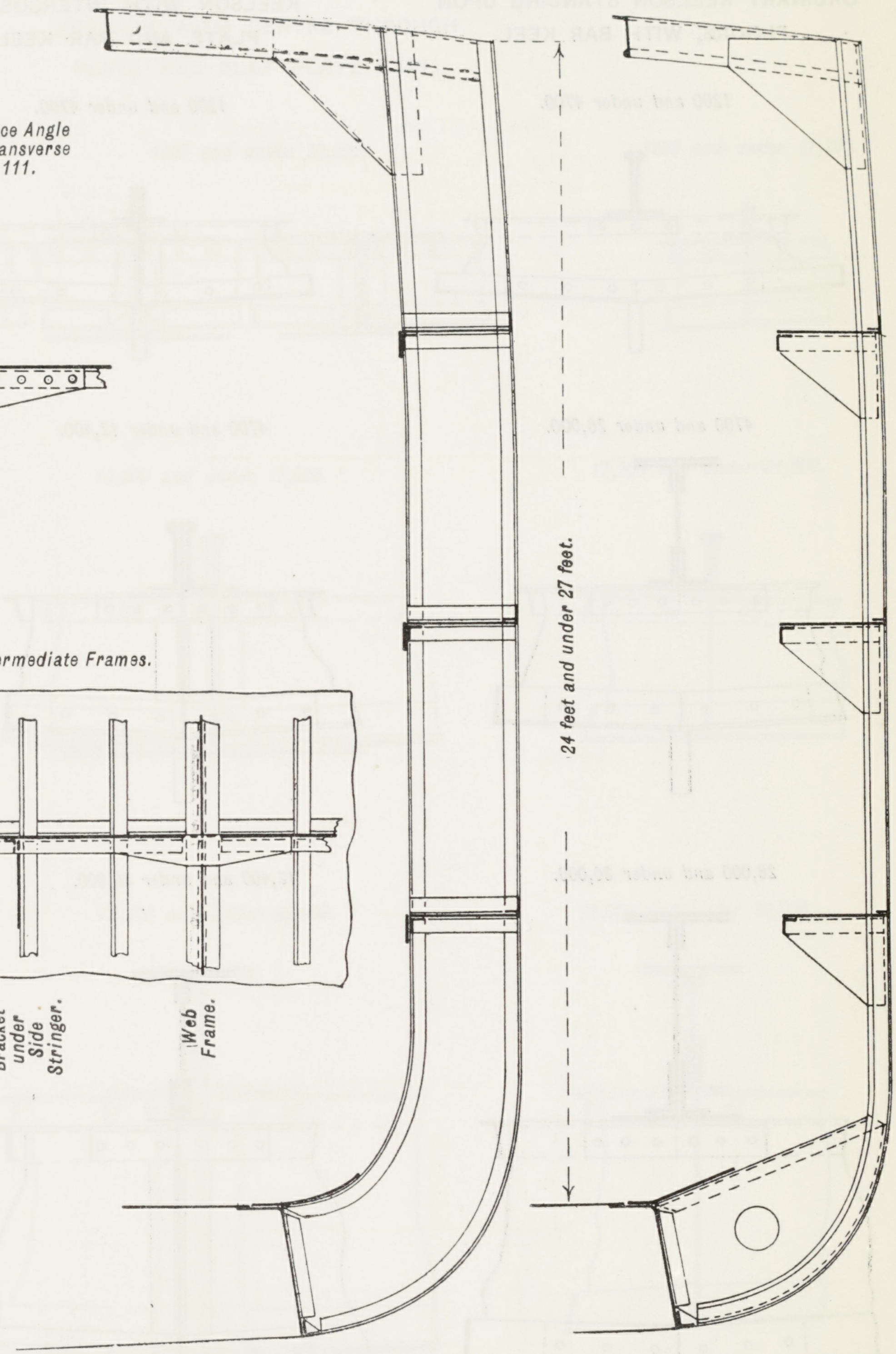


Elevation showing Web Frames and Intermediate Frames.



Section at Web Frame.

Section at Intermediate Frame, with Brackets under Side Stringers.

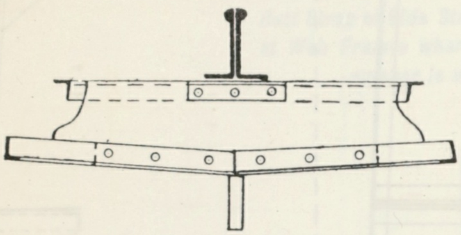


MIDDLE LINE KEELSONS.

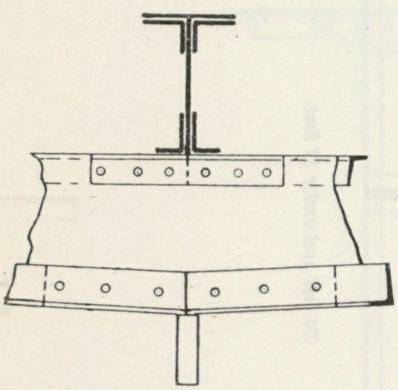
(Section 14 and Table 6.)

ORDINARY KEELSON STANDING UPON FLOORS, WITH BAR KEEL.

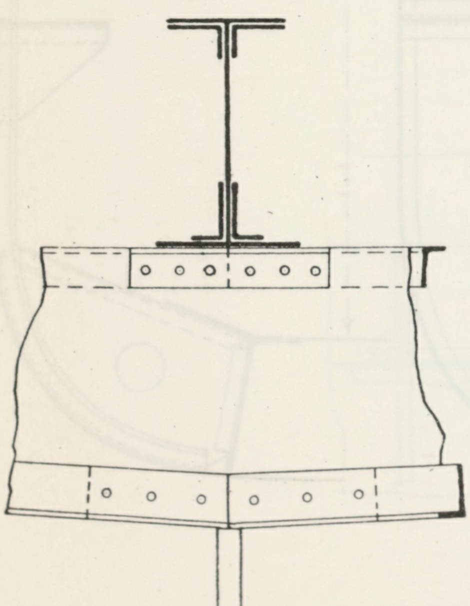
1200 and under 4700.



4700 and under 26,000.

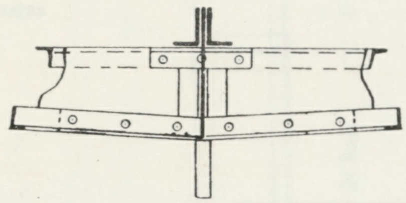


26,000 and under 36,000.

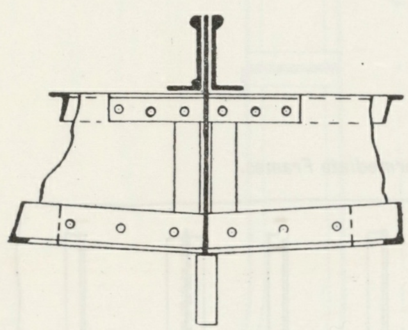


KEELSON WITH INTERCOSTAL PLATE AND BAR KEEL.

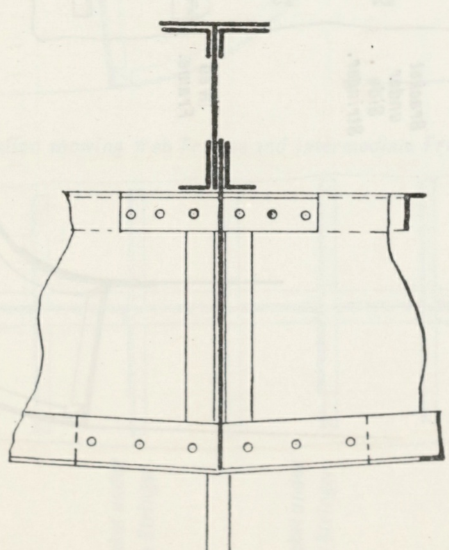
1200 and under 4700.



4700 and under 12,400.

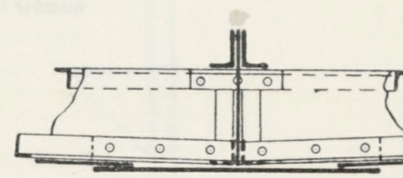


12,400 and under 36,000.

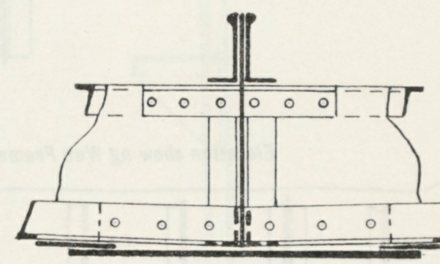


KEELSON WITH INTERCOSTAL PLATE AND FLAT PLATE KEEL.

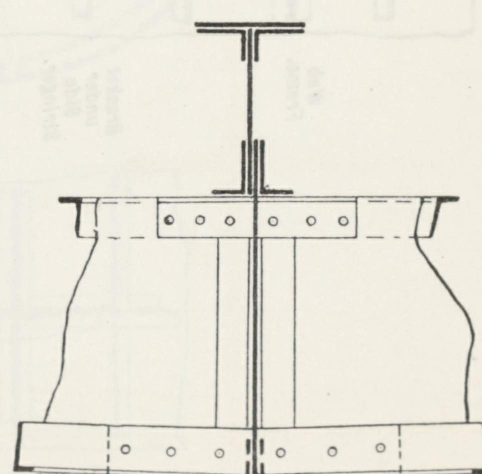
1200 and under 4700.



4700 and under 12,400.



12,400 and under 36,000.



MIDDLE LINE KEELSONS.

(Section 14 and Table 6.)

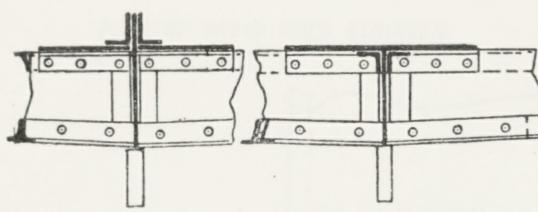
SIDE KEELSONS.

(Section 14 and Table 6.)

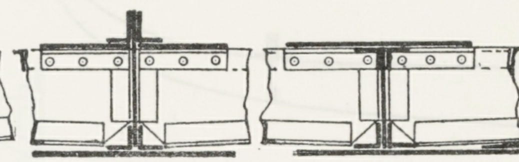
KEELSON WITH CENTRE THROUGH PLATE AND BAR KEEL.

KEELSON WITH CENTRE THROUGH PLATE AND FLAT PLATE KEEL.

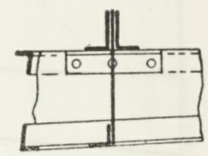
1200 and under 10,000.



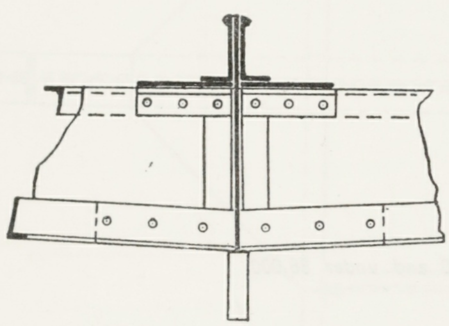
1200 and under 10,000.



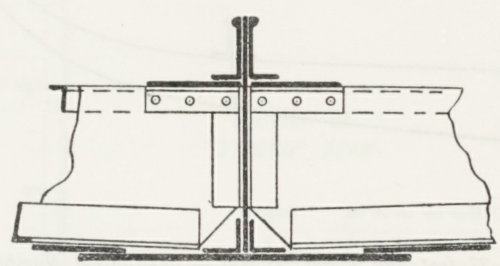
1200 and under 17,200.



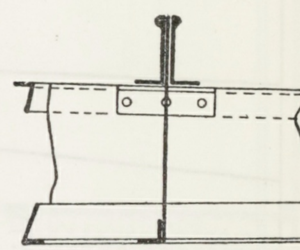
10,000 and under 17,200.



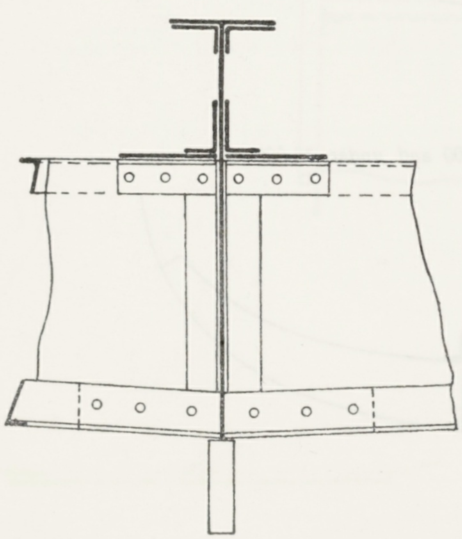
10,000 and under 17,200.



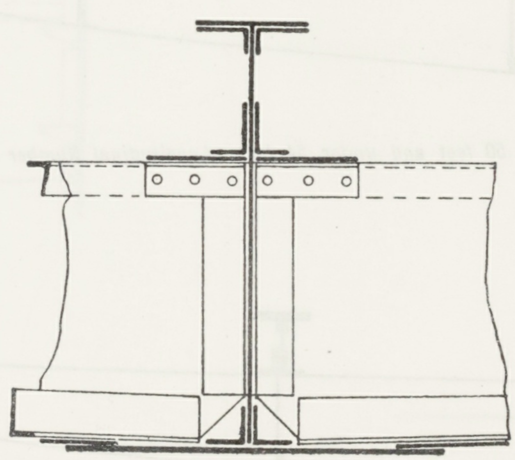
17,200 and under 21,000.



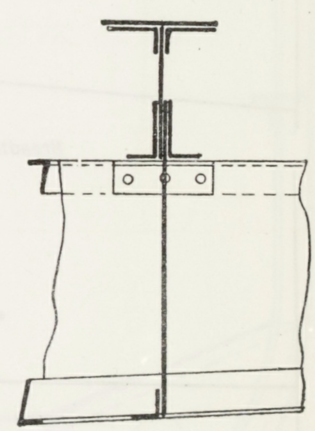
17,200 and under 36,000.



17,200 and under 36,000.



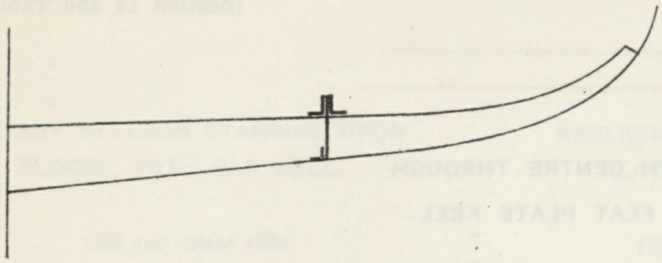
21,000 and under 36,000.



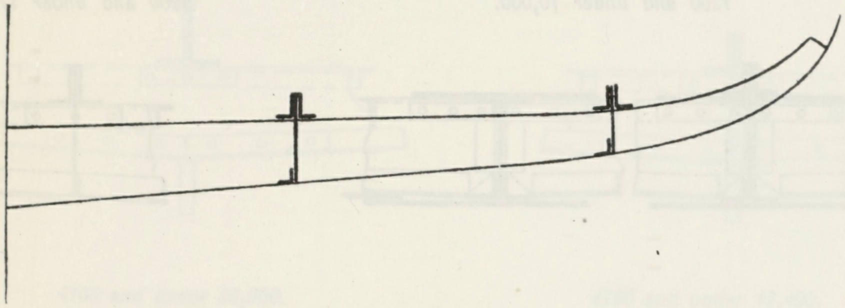
SIDE AND BILGE KEELSONS.

(Section 14 and Table 6.)

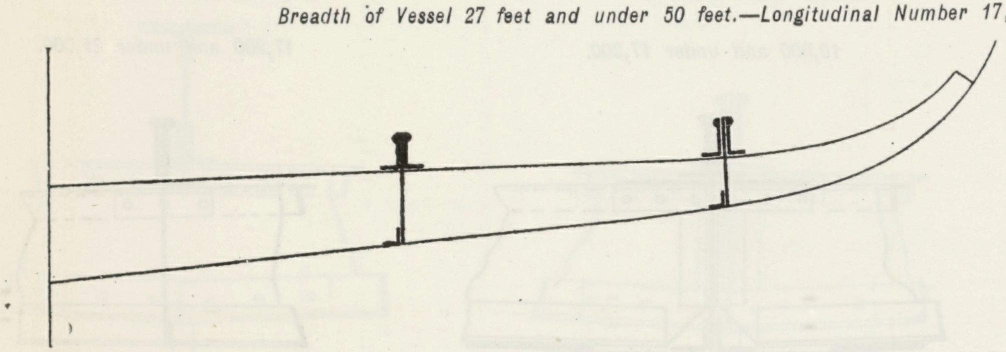
Breadth of Vessel under 27 feet.



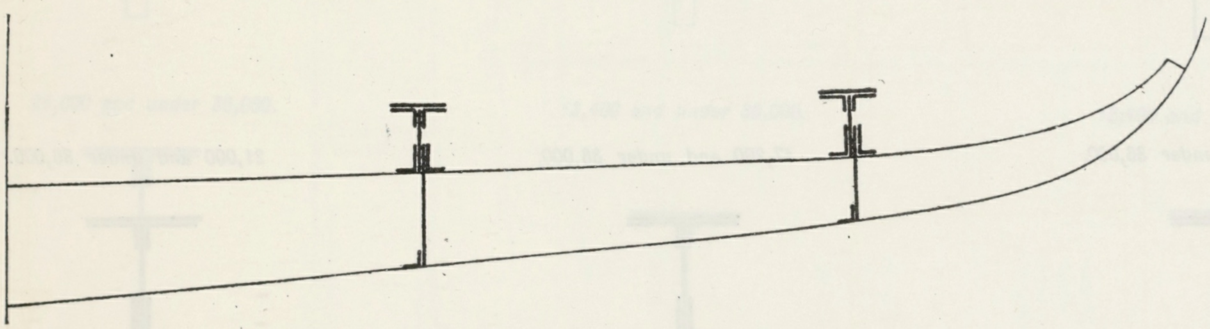
Breadth of Vessel 27 feet and under 50 feet.—Longitudinal Number under 17,200.



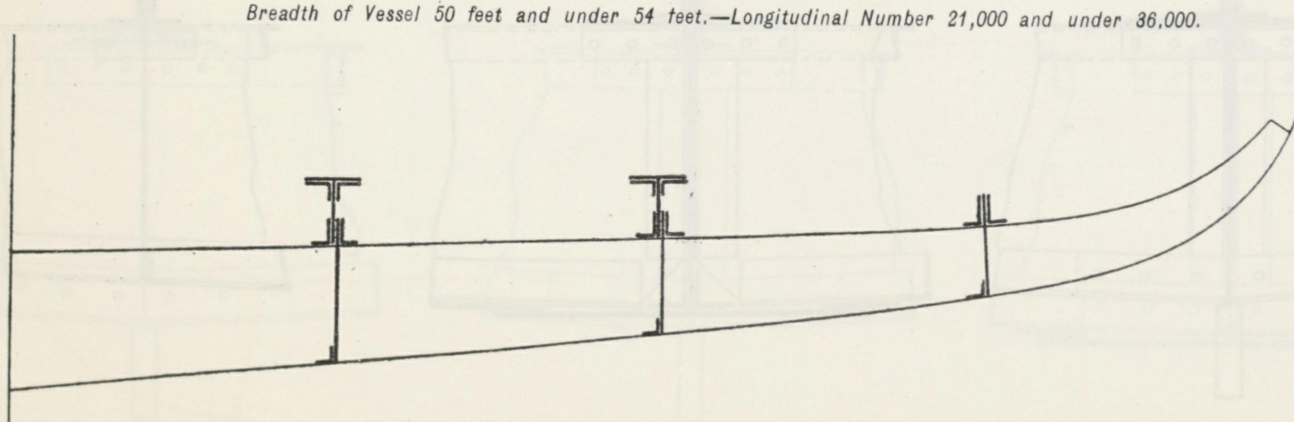
Breadth of Vessel 27 feet and under 50 feet.—Longitudinal Number 17,200 and under 21,000.



Breadth of Vessel 27 feet and under 50 feet.—Longitudinal Number 21,000 and under 36,000.



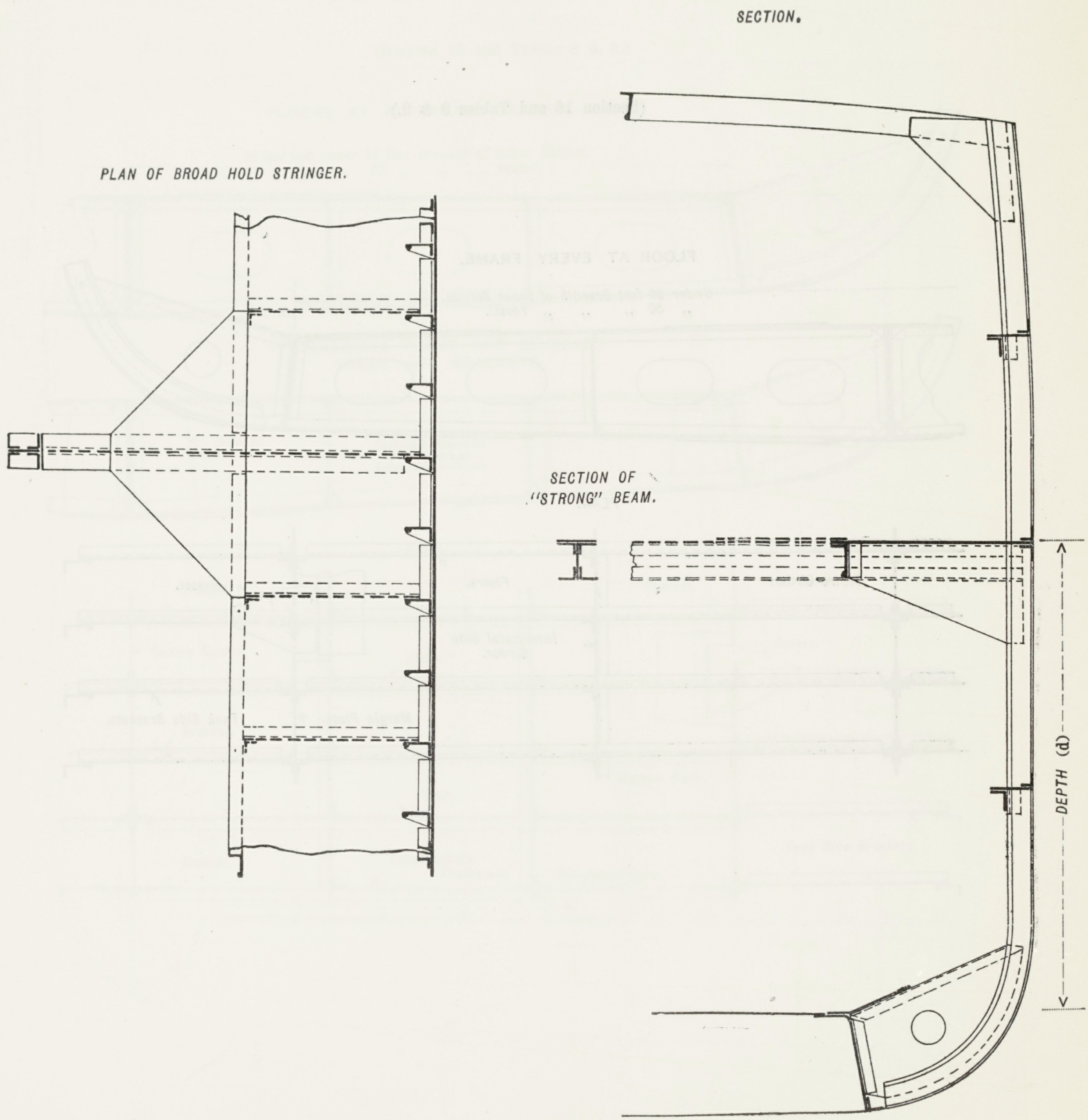
Breadth of Vessel 50 feet and under 54 feet.—Longitudinal Number 21,000 and under 36,000.



WIDELY SPACED BEAMS IN HOLD.

(Section 21 and Table 12.)

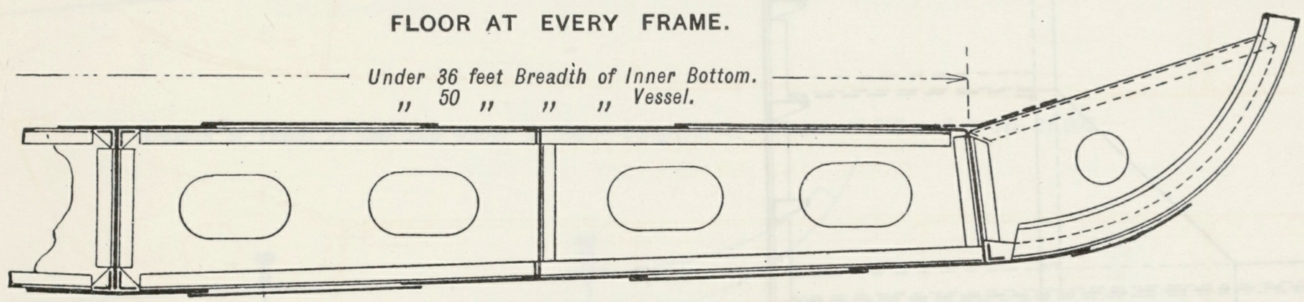
SKETCH SHOWING BROAD HOLD STRINGER, FACE BAR, BRACKETS SUPPORTING STRINGER, "STRONG" HOLD BEAMS AND GUSSET PLATE.



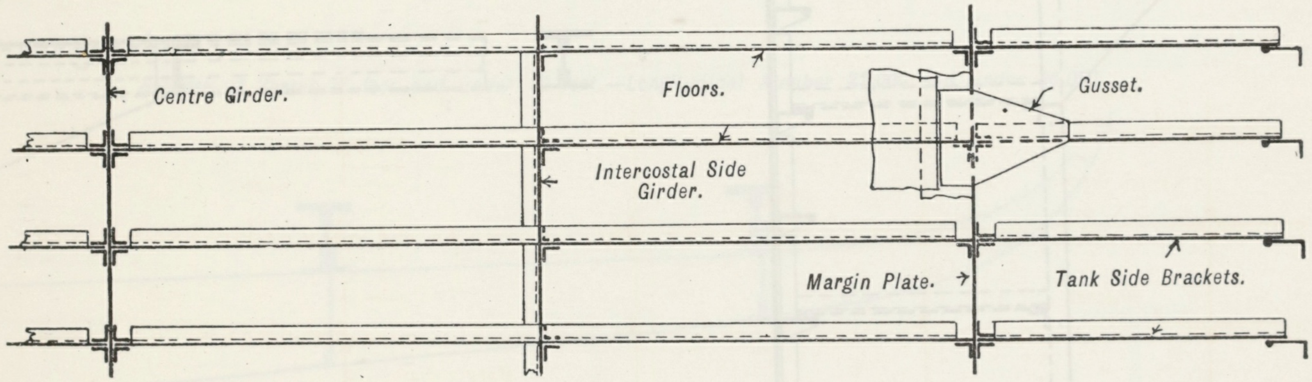
CELLULAR DOUBLE BOTTOMS.

(Section 16 and Tables 8 & 9.)

FLOOR AT EVERY FRAME.

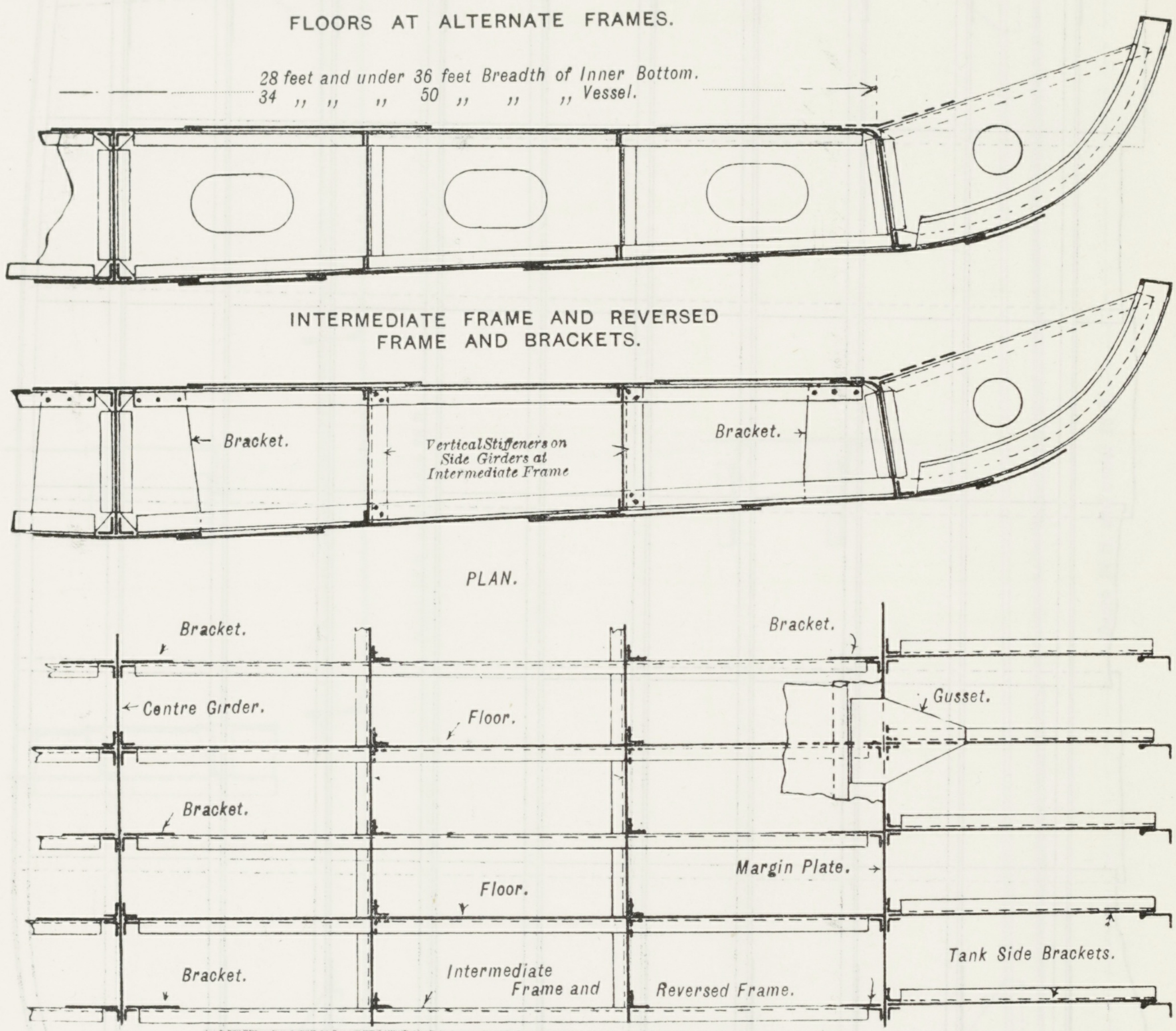


PLAN.



CELLULAR DOUBLE BOTTOMS.

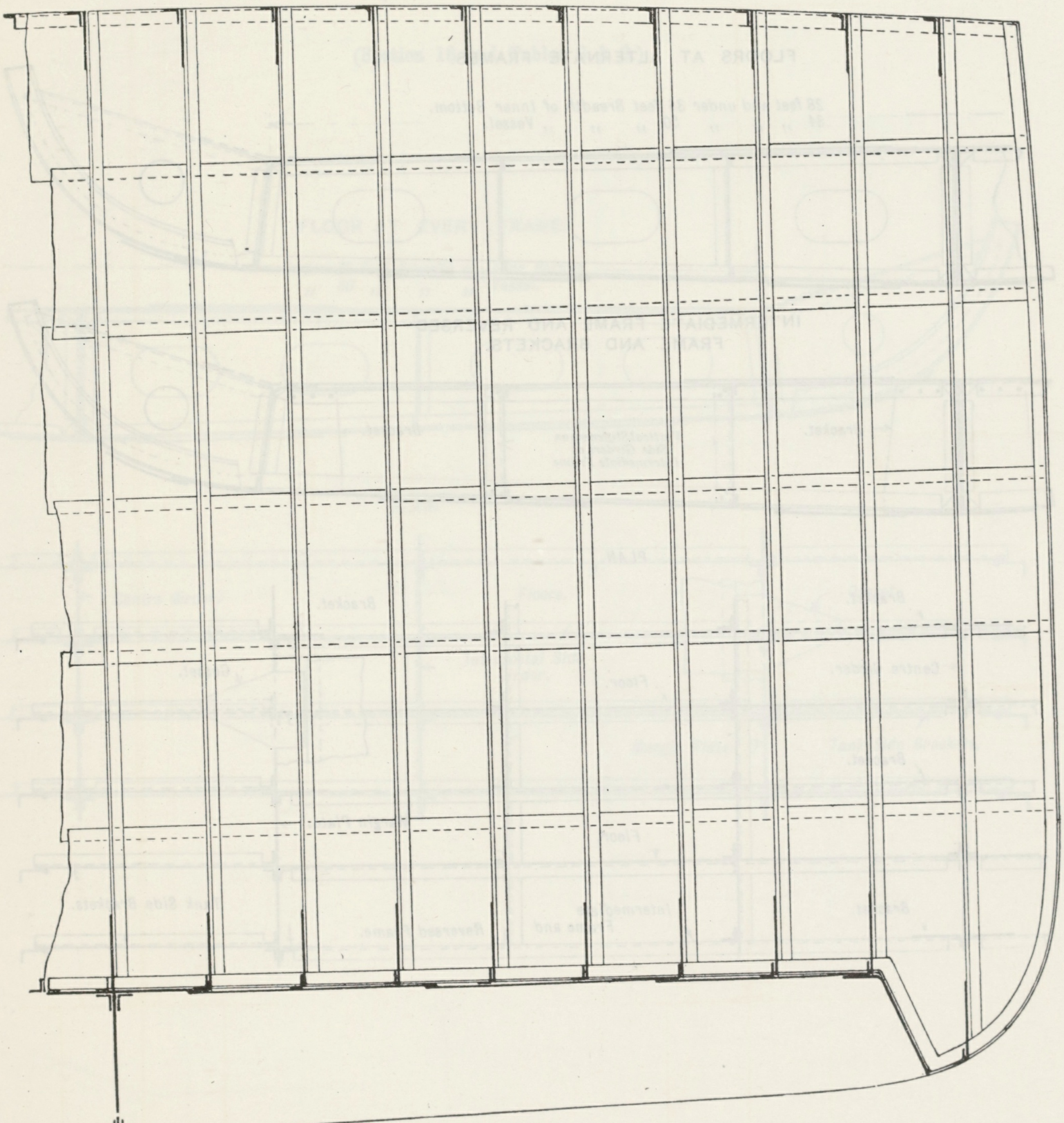
(Section 16 and Tables 8 & 9.)



WATERTIGHT BULKHEAD.

ARRANGEMENT OF BULB ANGLE STIFFENERS SPACED 30 INCHES APART AND BRACKETED AT HEAD AND HEEL.

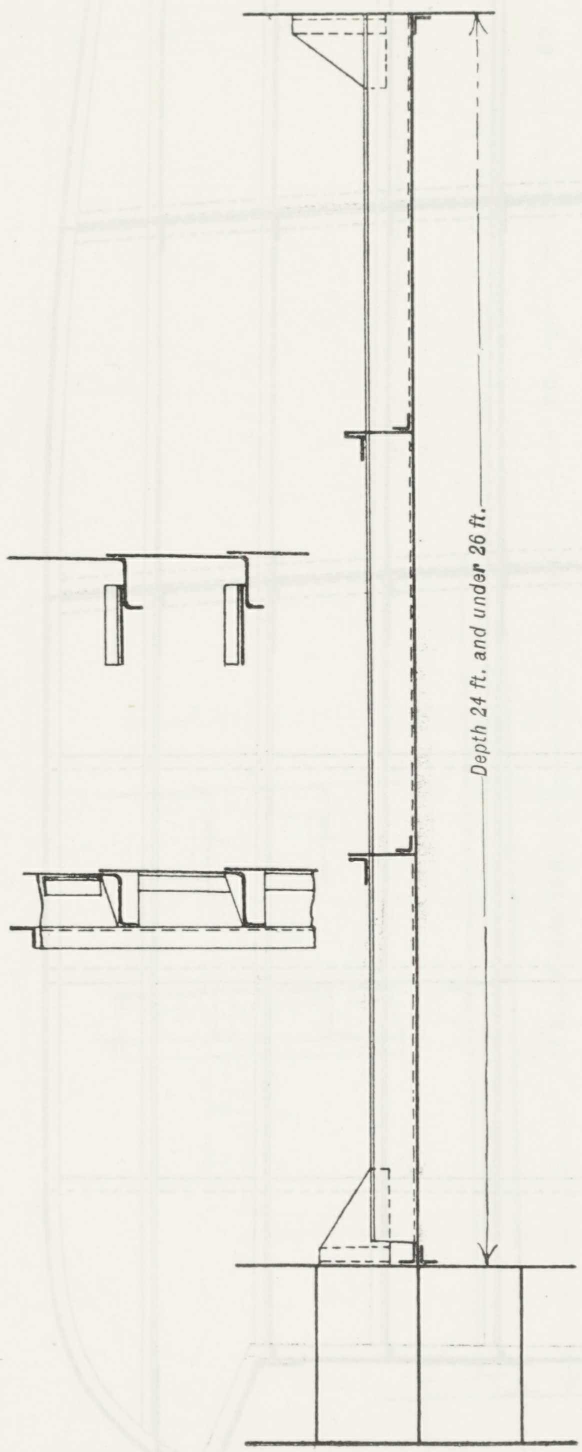
(Section 19 and Table 10.)



WATERTIGHT BULKHEAD.

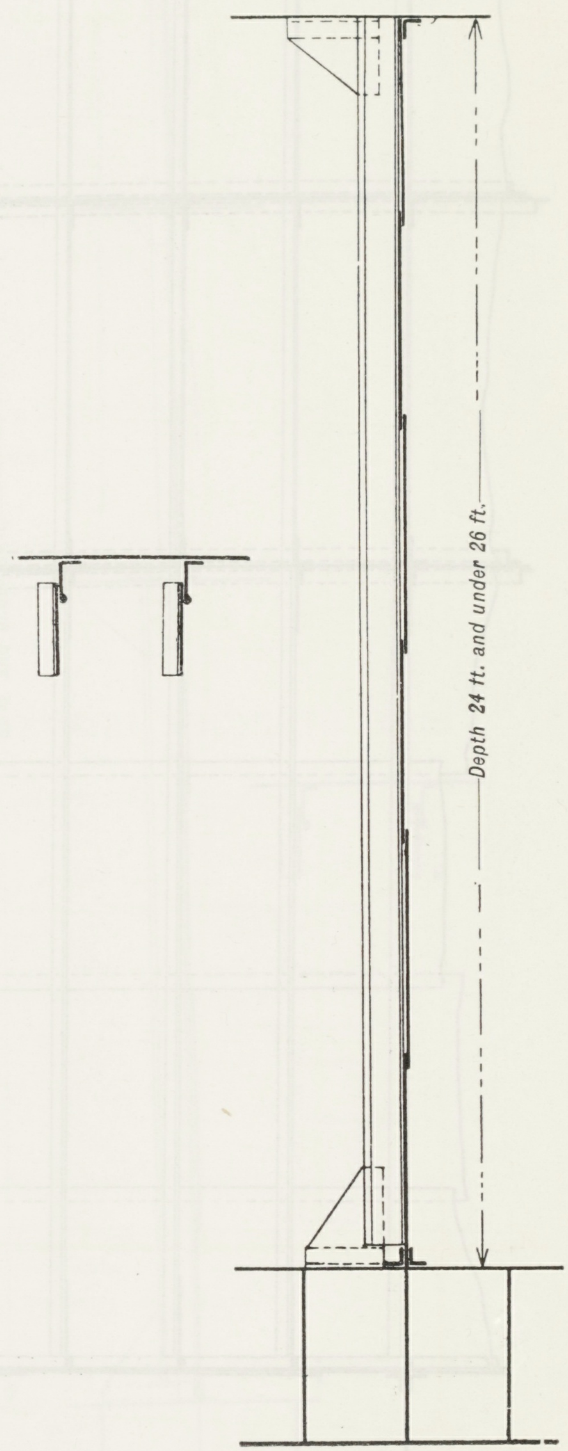
FLANGED PLATE STIFFENERS AND HORIZONTAL TIE BARS WITH INTERCOSTAL PLATE.

(Section 19 and Table 10.)



BULB ANGLE STIFFENERS.

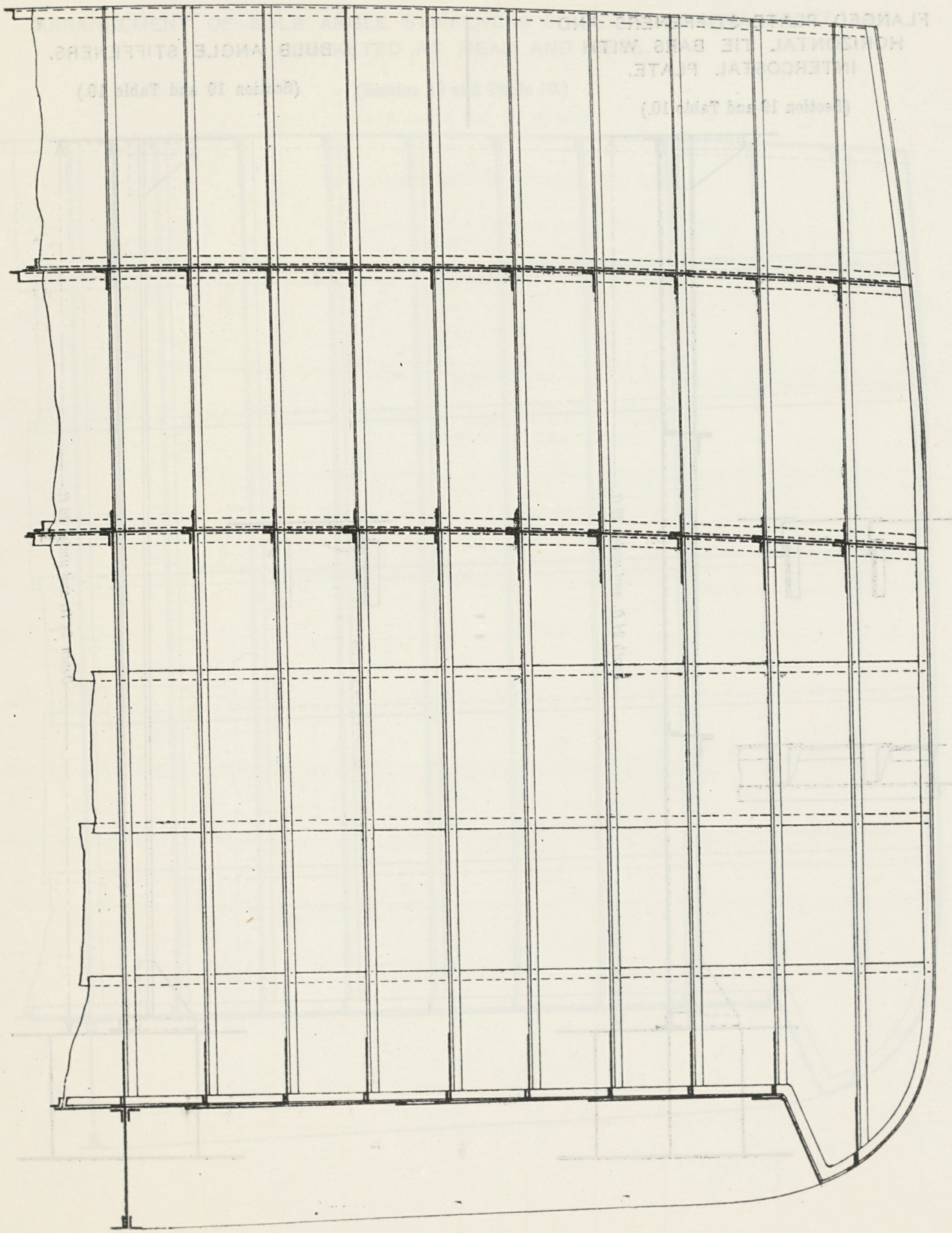
(Section 19 and Table 10.)



WATERTIGHT BULKHEAD.

ARRANGEMENT OF VERTICAL STIFFENERS SPACED 30 INCHES APART IN HOLD AND 'TWEEN DECKS.

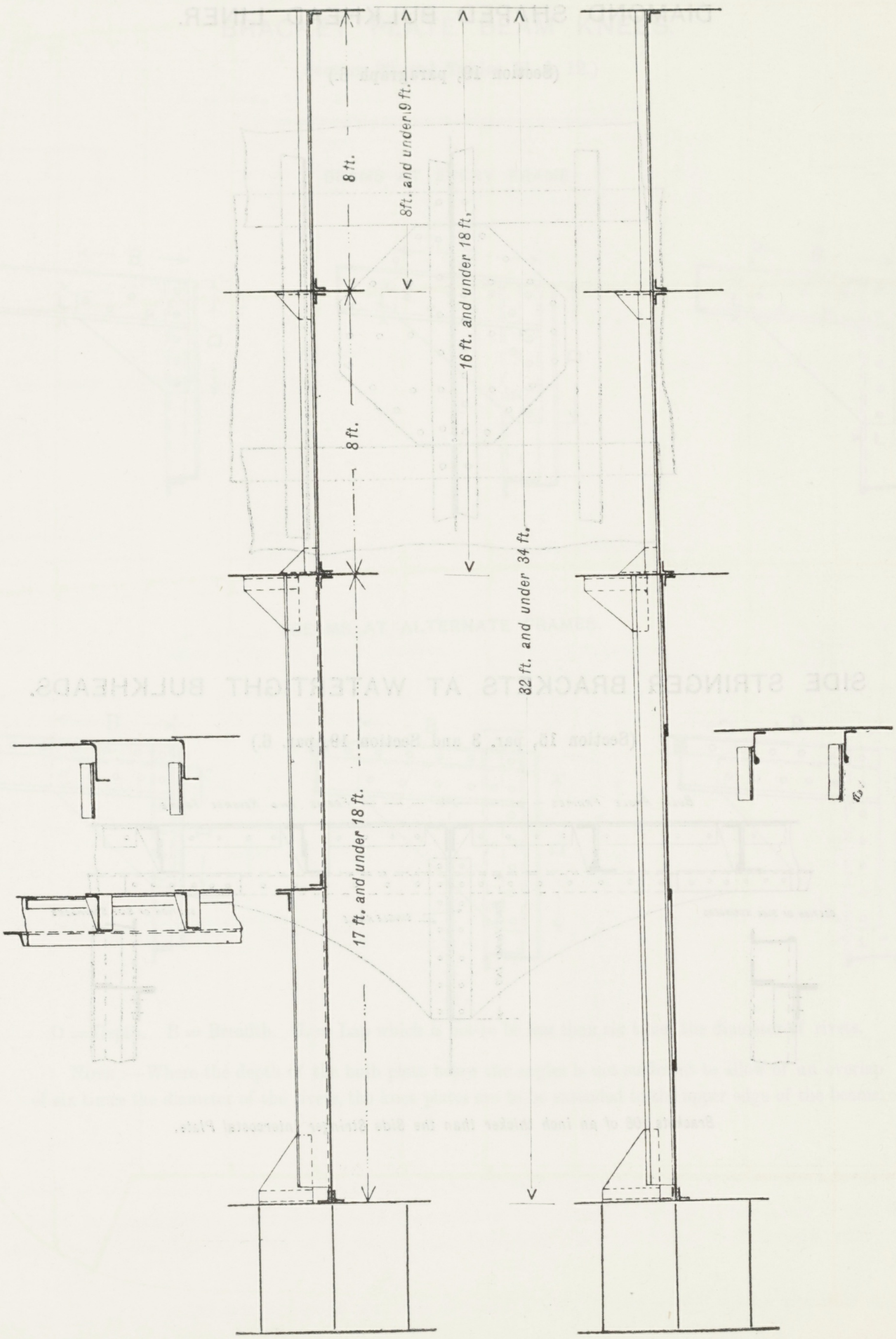
(Section 19 and Table 10.)



WATERTIGHT BULKHEAD.

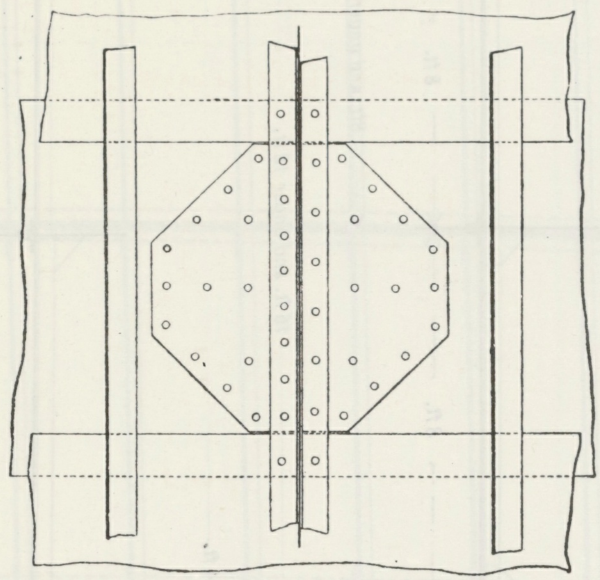
FLANGED PLATE STIFFENERS AND HORIZONTAL TIE BAR WITH INTERCOSTAL PLATE IN HOLD.
(Section 19 and Table 10.)

STIFFENERS IN HOLD AND 'TWEEN DECKS.
(Section 19 and Table 10.)



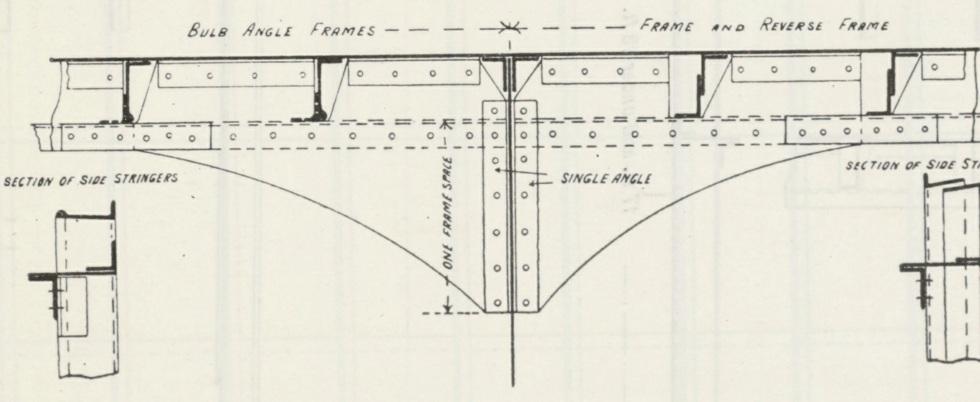
DIAMOND SHAPED BULKHEAD LINER.

(Section 19, paragraph 6.)



SIDE STRINGER BRACKETS AT WATERTIGHT BULKHEADS.

(Section 15, par. 3 and Section 19, par. 6.)

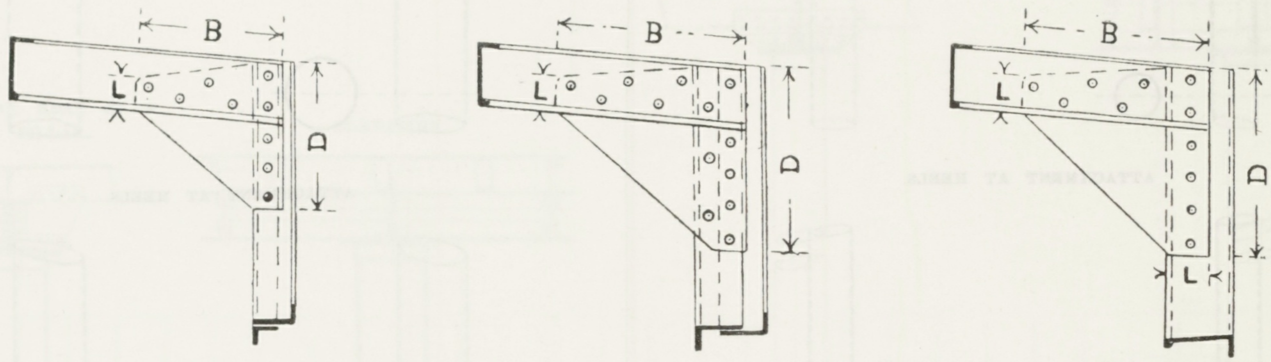


Brackets ·06 of an inch thicker than the Side Stringer Intercostal Plate.

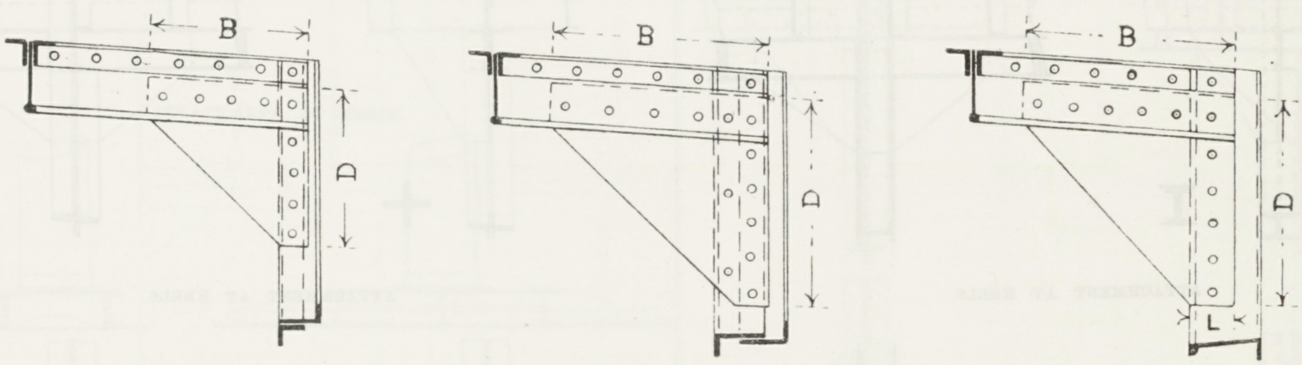
BRACKET PLATE BEAM KNEES.

(Section 20 and Tables 11 & 12.)

BEAMS AT EVERY FRAME.



BEAMS AT ALTERNATE FRAMES.

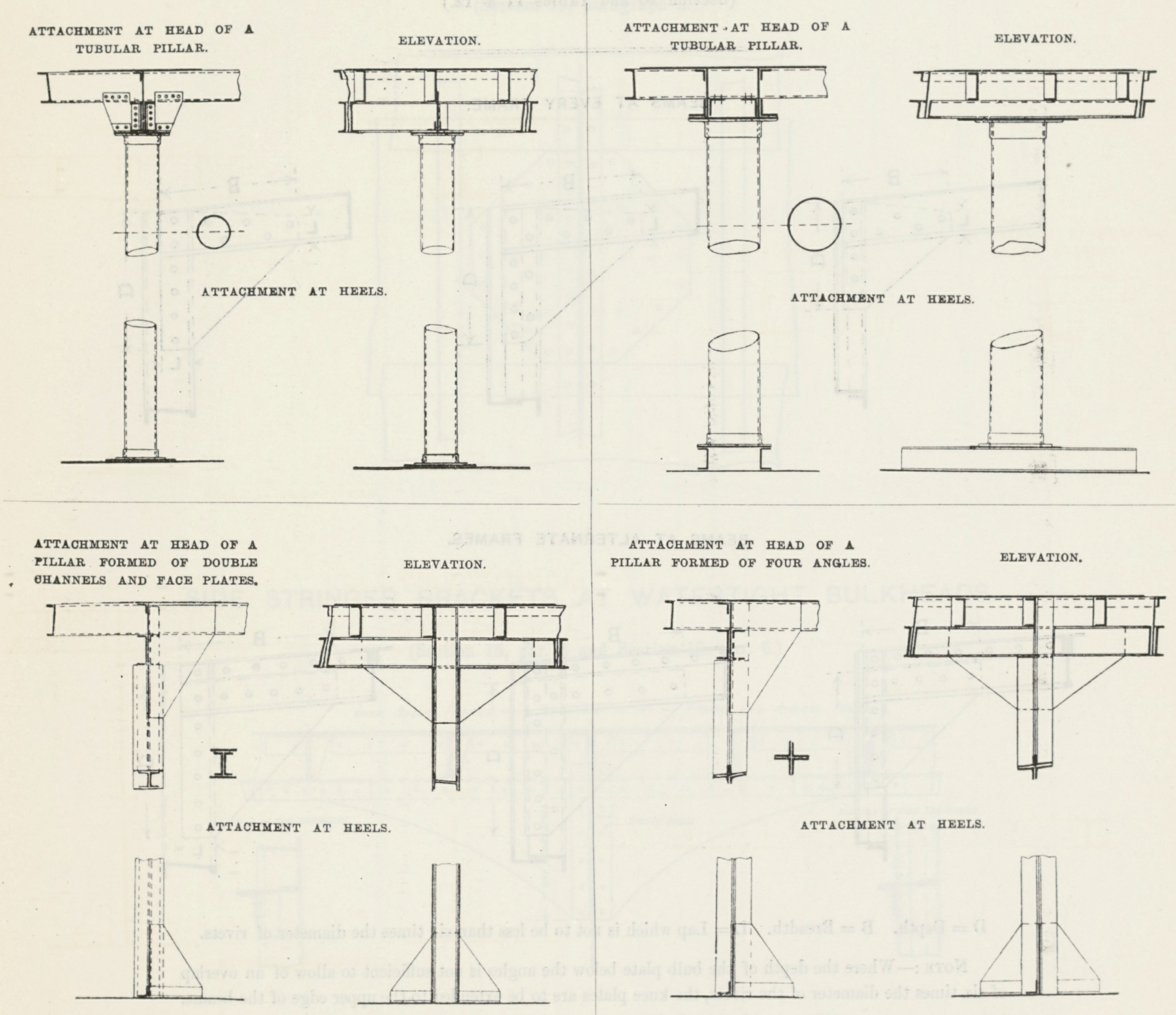


D = Depth. B = Breadth. L = Lap which is not to be less than six times the diameter of rivets.

NOTE :—Where the depth of the bulb plate below the angles is not sufficient to allow of an overlap of six times the diameter of the rivets, the knee plates are to be extended to the upper edge of the beams.

SOME METHODS OF ATTACHING THE WIDELY SPACED PILLARS AT HEADS AND HEELS.

(Section 22 and Table 15.)



1. Pillars and girders of other form will be admitted provided the same are of equivalent strength to those given in Tables 15 and 16.

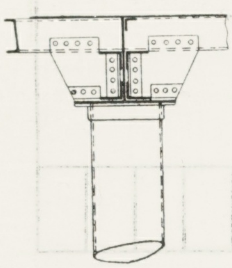
2 Where no seating is fitted, widely spaced hold pillars are to be stepped when practicable at an intersection of floors and intercostals; but in cases wherein this cannot be done, intercostal brackets are to be fitted on each side of the floors beneath the pillars.

3. For Scantlings of widely spaced Pillars, and Girders at heads of same, *see* Tables 15 and 16.

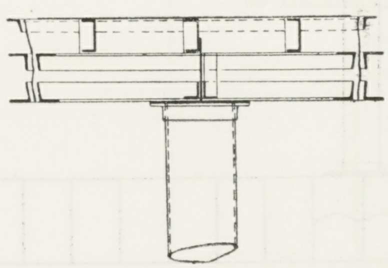
SOME METHODS OF ATTACHING THE WIDELY SPACED PILLARS AT HEADS AND HEELS.

(Section 22 and Table 15.)

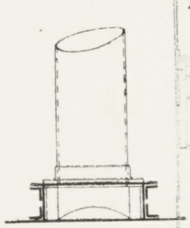
ATTACHMENT AT HEAD OF A TUBULAR PILLAR.

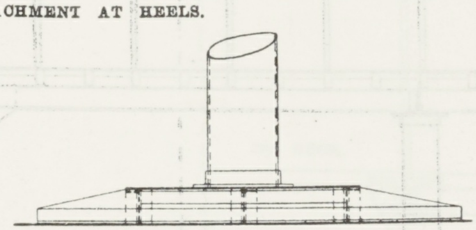


ELEVATION.

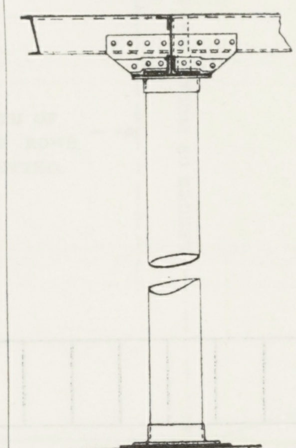


ATTACHMENT AT HEELS.

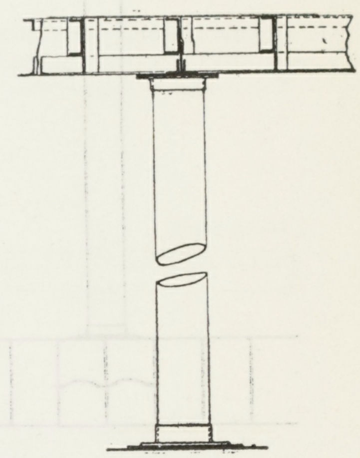




ATTACHMENT AT HEAD OF A TUBULAR PILLAR.

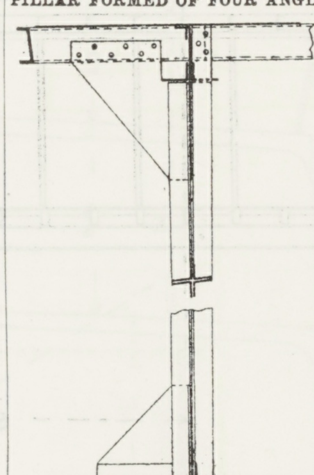


ELEVATION.

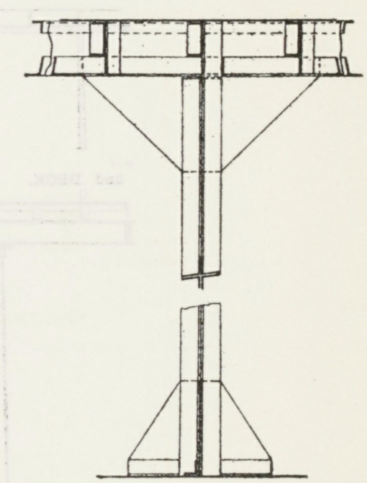


ATTACHMENT AT HEELS.

ATTACHMENT AT HEAD OF A PILLAR FORMED OF FOUR ANGLES.

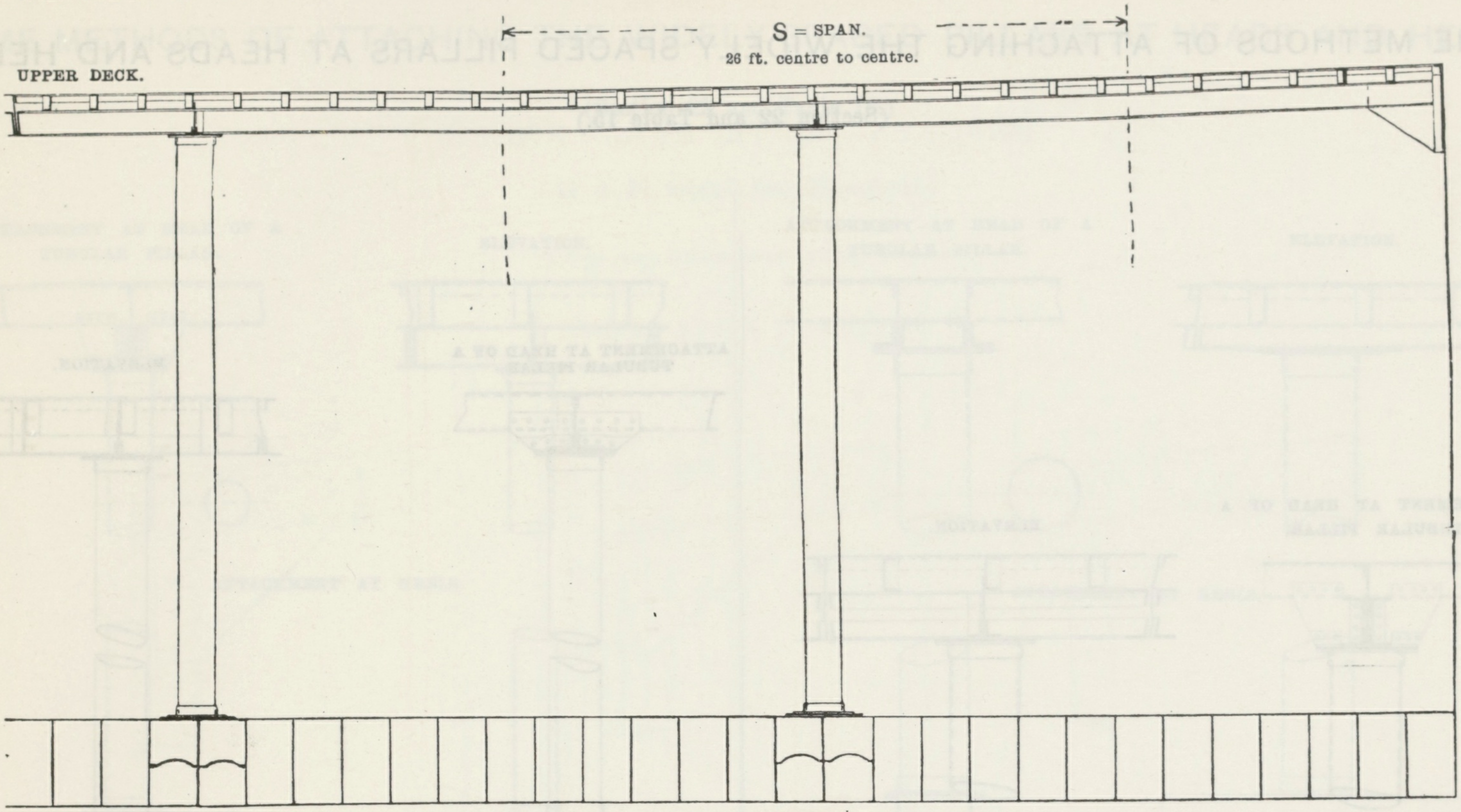


ELEVATION.

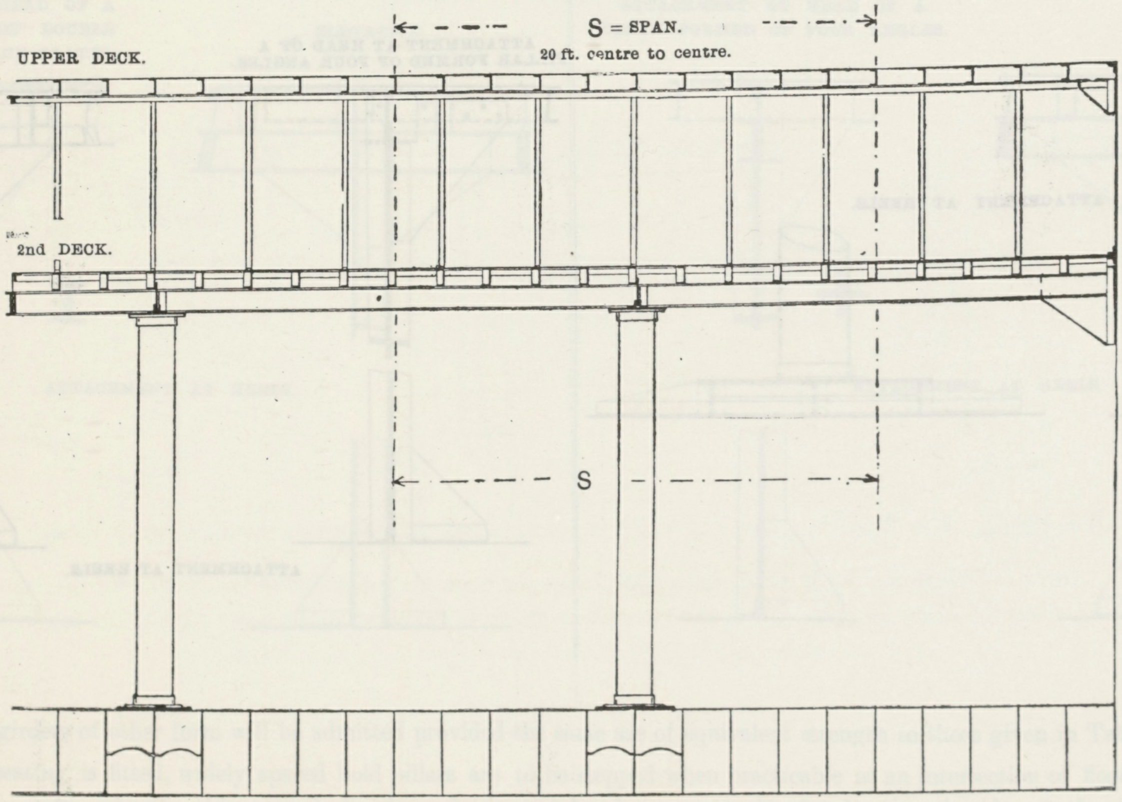


ATTACHMENT AT HEELS.

METHOD OF ESTIMATING NUMBERS FOR REGULATING SIZES OF PILLARS. (Section 22 and Table 15.)



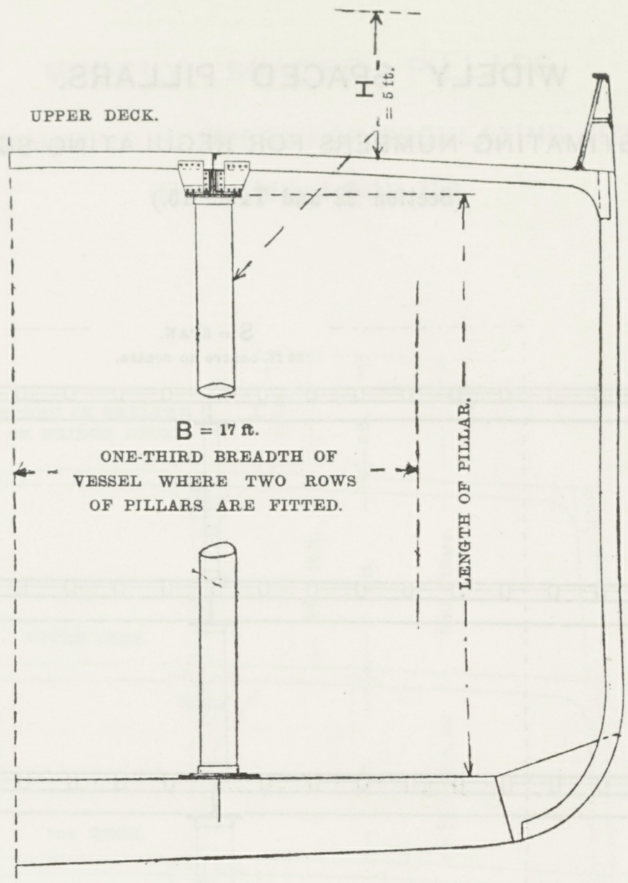
$$\text{Pillars } \frac{S \times B \times H}{100} = \frac{26 \times 17 \times 5}{100} = 22.$$

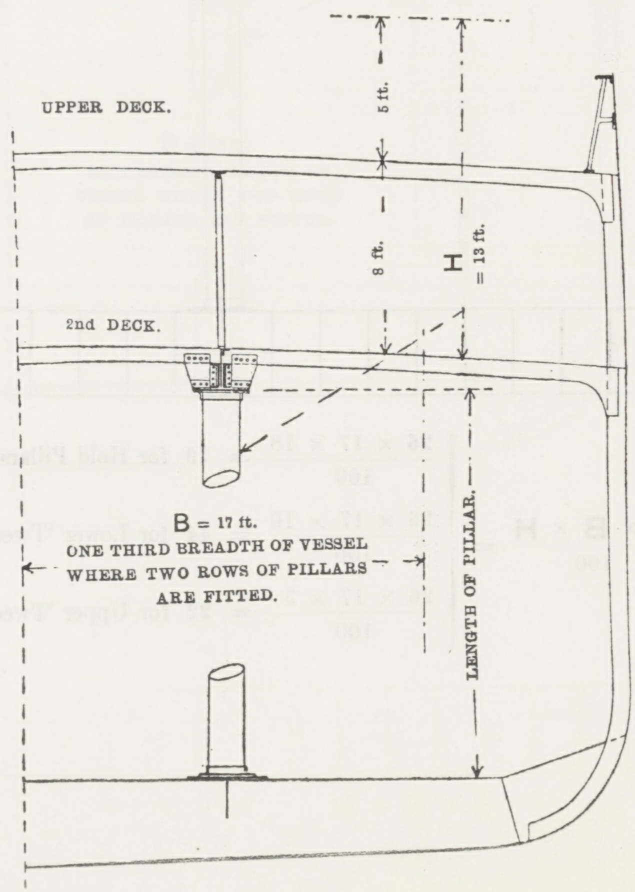


$$\text{Pillars } \frac{S \times B \times H}{100} = \frac{20 \times 17 \times 13}{100} = 44.$$

METHOD OF ESTIMATING NUMBERS FOR REGULATING SIZES OF PILLARS.

(Section 22 and Table 15.)

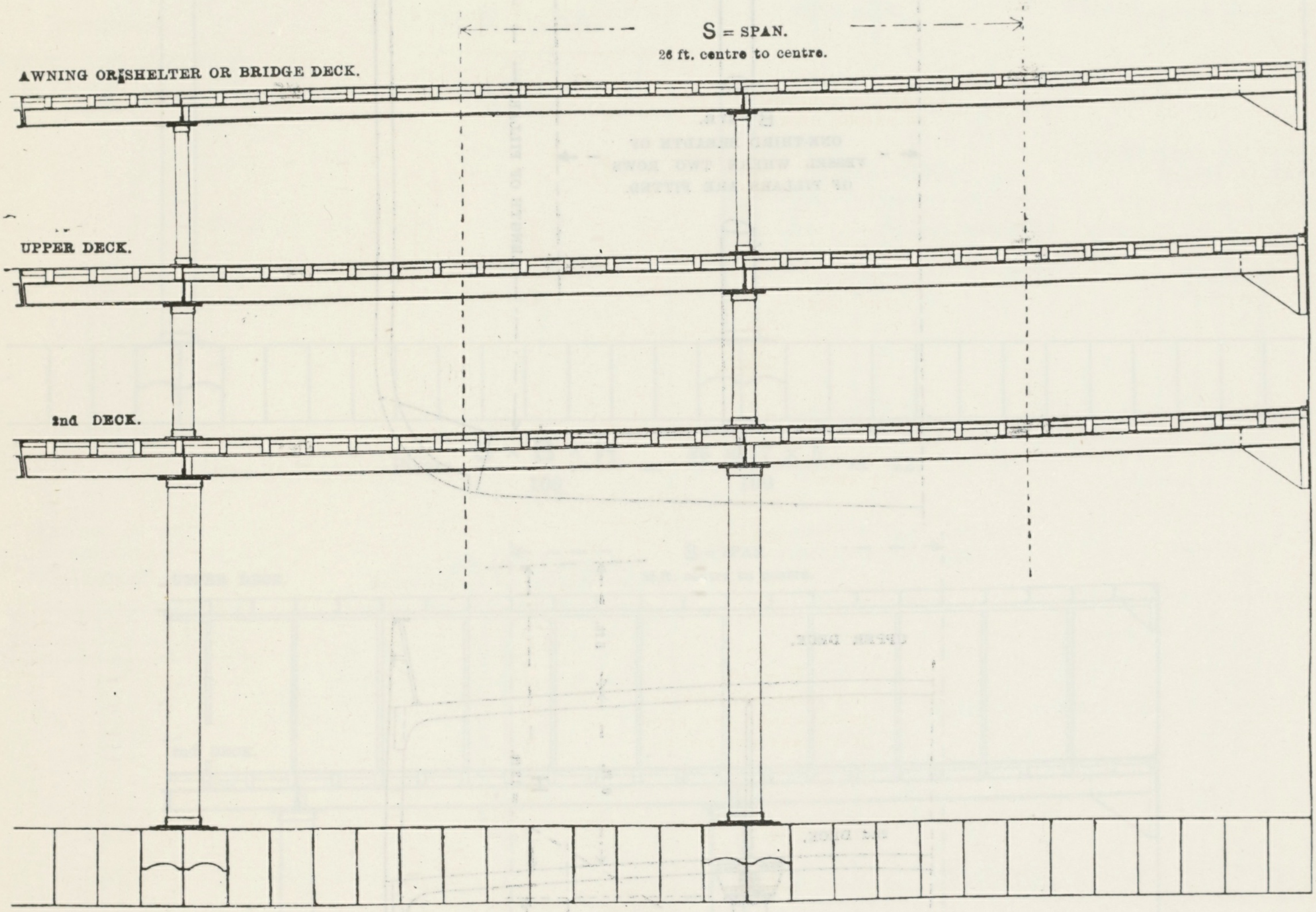




WIDELY SPACED PILLARS.

METHOD OF ESTIMATING NUMBERS FOR REGULATING SIZES OF PILLARS.

(Section 22 and Table 15.)

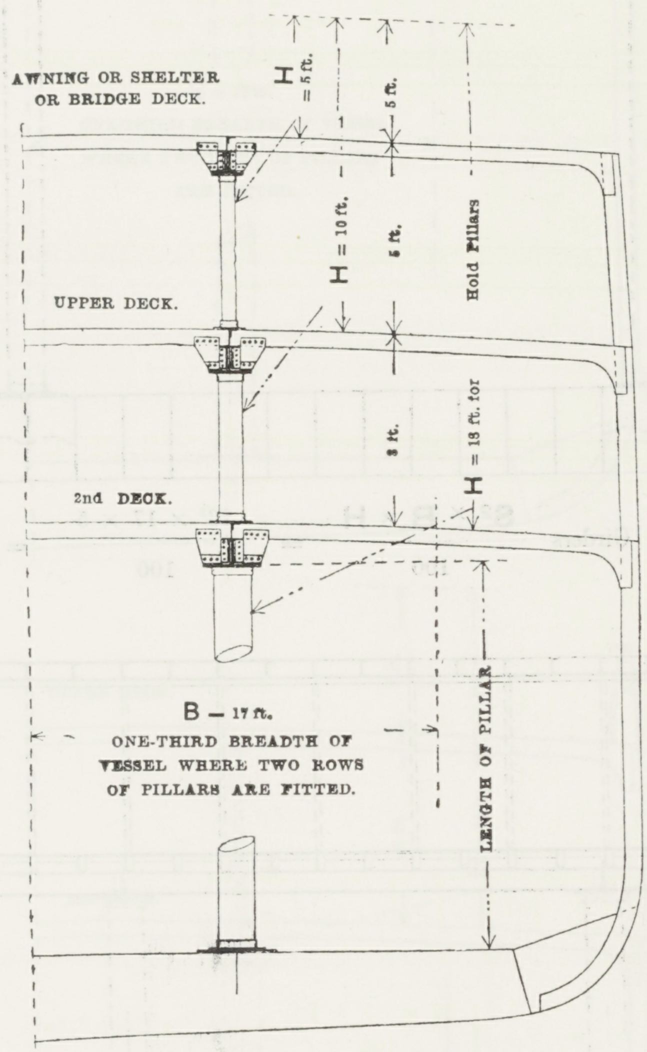


$$\text{Pillars } \frac{S \times B \times H}{100} = \begin{cases} \dfrac{26 \times 17 \times 18}{100} = 79 \text{ for Hold Pillars.} \\[2ex] \dfrac{26 \times 17 \times 10}{100} = 44 \text{ for Lower 'Tween Deck Pillars.} \\[2ex] \dfrac{26 \times 17 \times 5}{100} = 22 \text{ for Upper 'Tween Deck Pillars.} \end{cases}$$

WIDELY SPACED PILLARS.

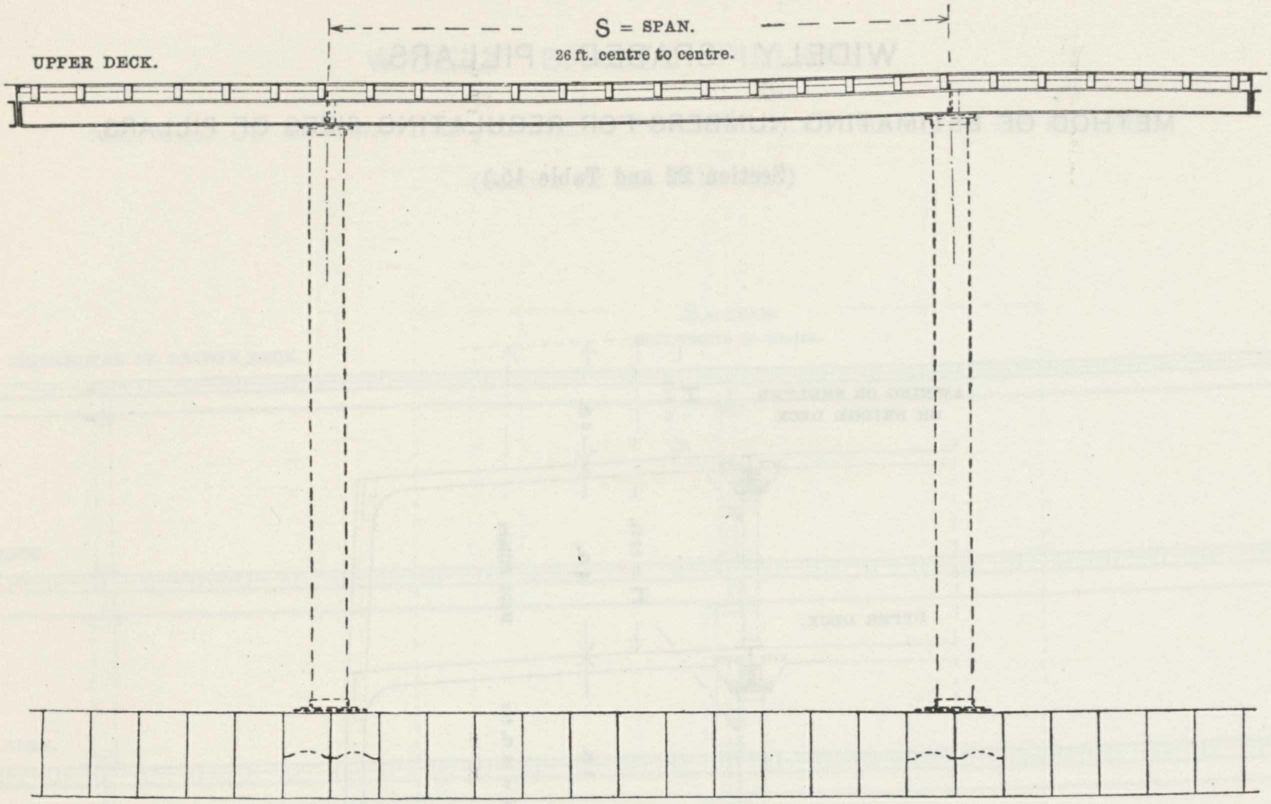
METHOD OF ESTIMATING NUMBERS FOR REGULATING SIZES OF PILLARS.

(Section 22 and Table 15.)

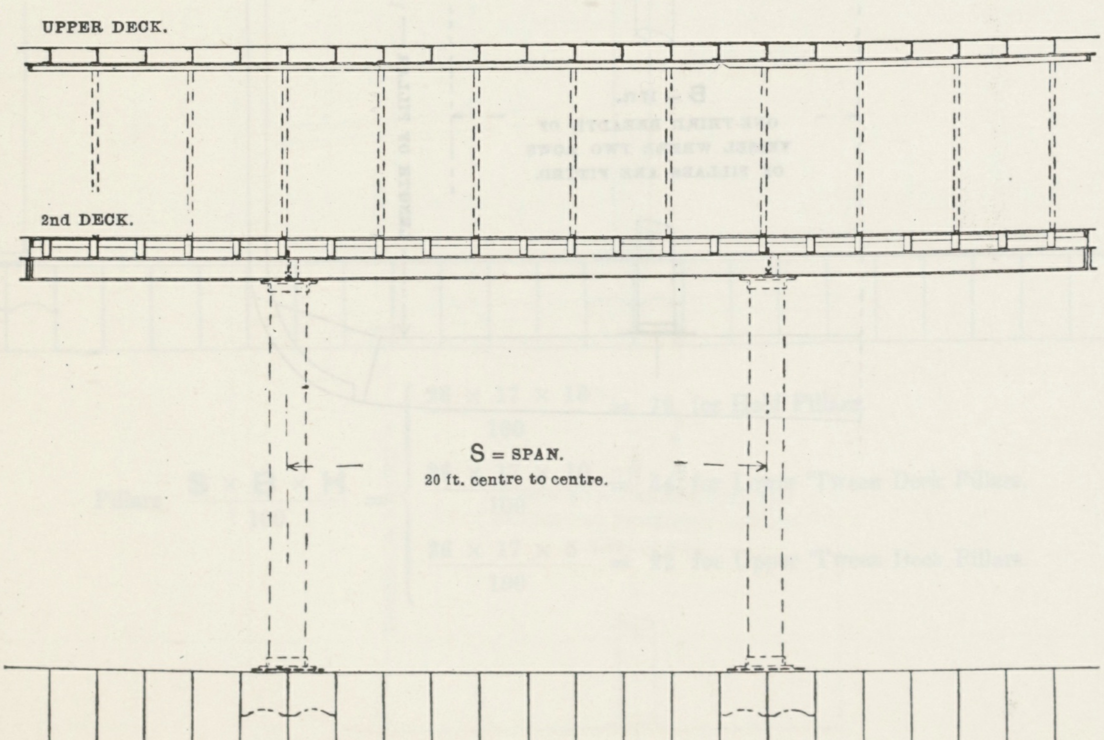


METHOD OF ESTIMATING NUMBERS FOR REGULATING SCANTLINGS OF GIRDERS.

(Section 22 and Table 16.)



$$\text{Girders } \frac{S^2 \times B \times H}{100} = \frac{26^2 \times 17 \times 5}{100} = 574.$$

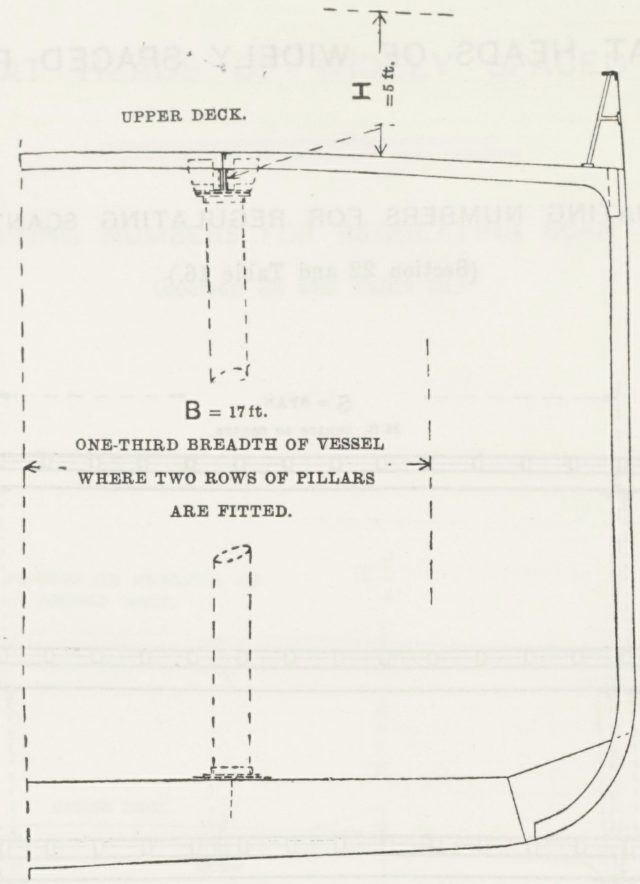


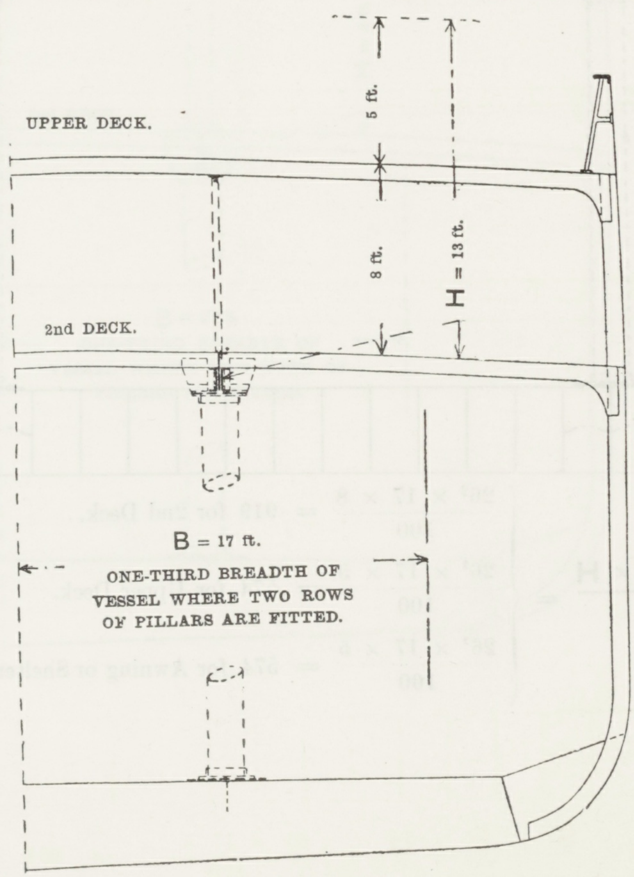
$$\text{Girders } \frac{S^2 \times B \times H}{100} = \frac{20^2 \times 17 \times 13}{100} = 884.$$

GIRDERS AT HEADS OF WIDELY SPACED PILLARS.

METHOD OF ESTIMATING NUMBERS FOR REGULATING SCANTLINGS OF GIRDERS.

(Section 22 and Table 16.)

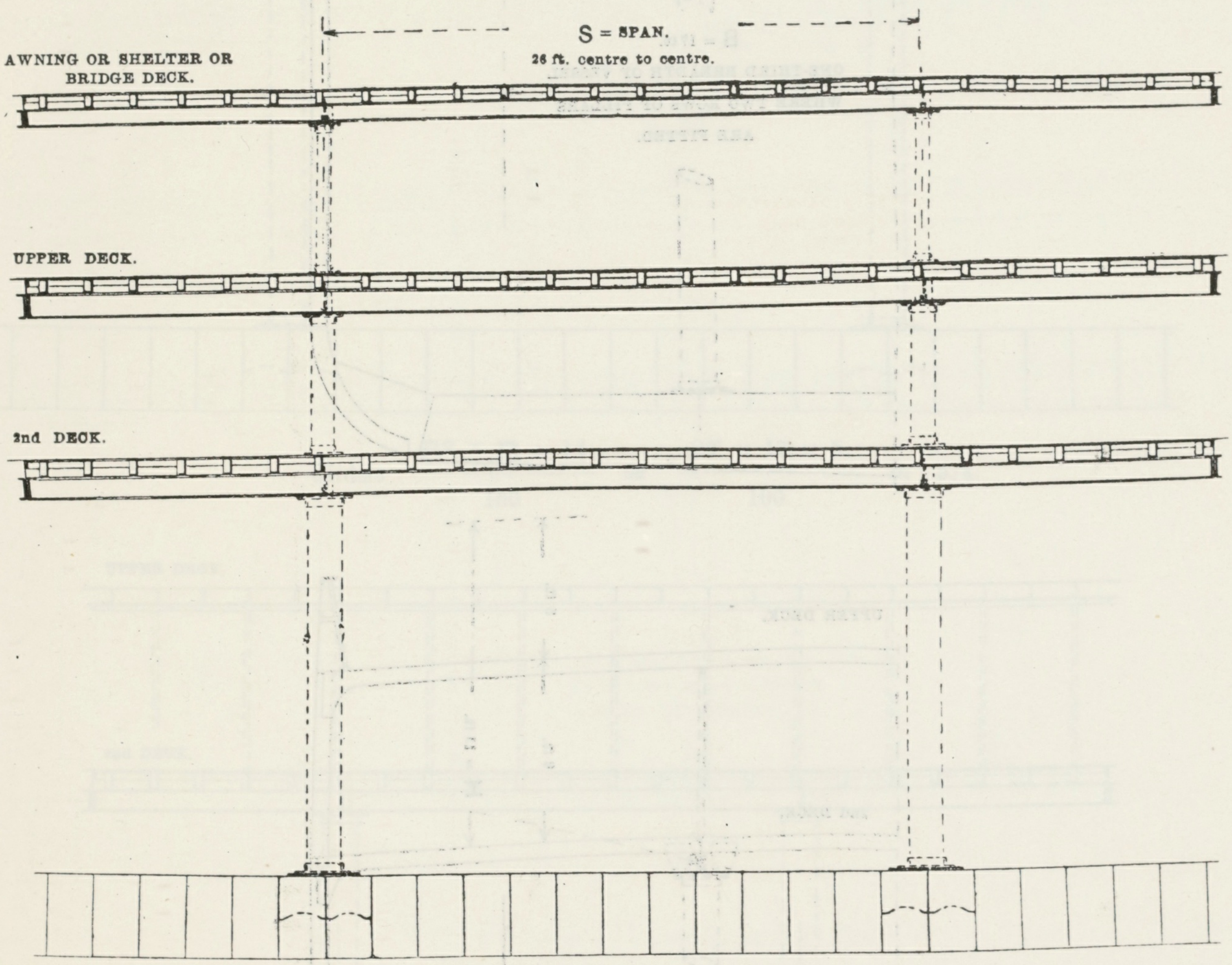




GIRDERS AT HEADS OF WIDELY SPACED PILLARS.

METHOD OF ESTIMATING NUMBERS FOR REGULATING SCANTLINGS OF GIRDERS.

(Section 22 and Table 16.)

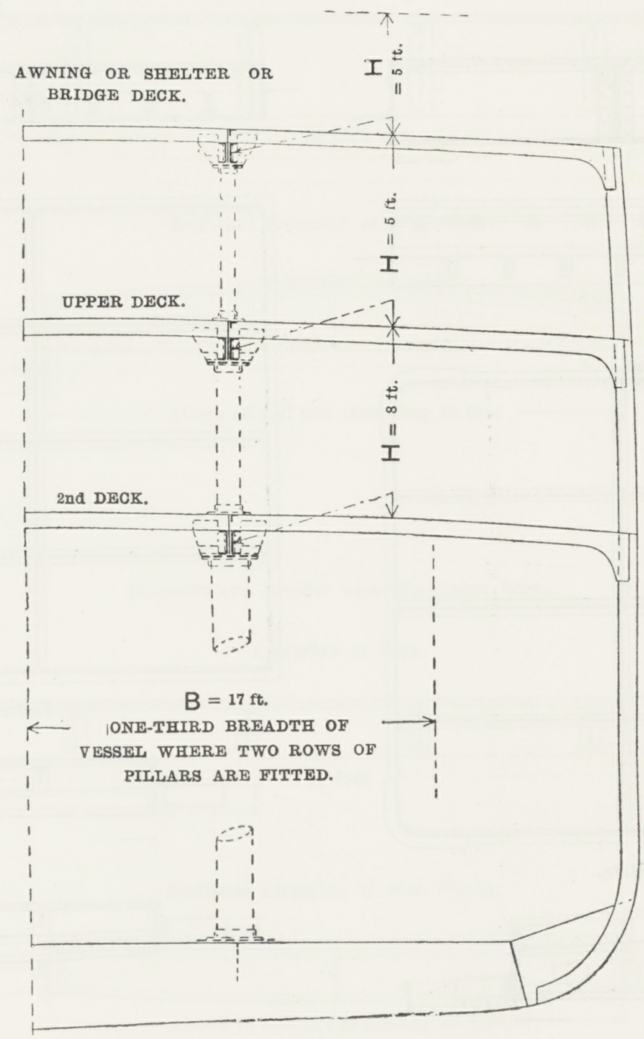


$$\text{Girders } \frac{S^2 \times B \times H}{100} = \begin{cases} \dfrac{26^2 \times 17 \times 8}{100} = 919 \text{ for 2nd Deck.} \\[2ex] \dfrac{26^2 \times 17 \times 5}{100} = 574 \text{ for Upper Deck.} \\[2ex] \dfrac{26^2 \times 17 \times 5}{100} = 574 \text{ for Awning or Shelter Deck or Bridge Deck.} \end{cases}$$

GIRDERS AT HEADS OF WIDELY SPACED PILLARS.

METHOD OF ESTIMATING NUMBERS FOR REGULATING SCANTLINGS OF GIRDERS.

(Section 22 and Table 16.)



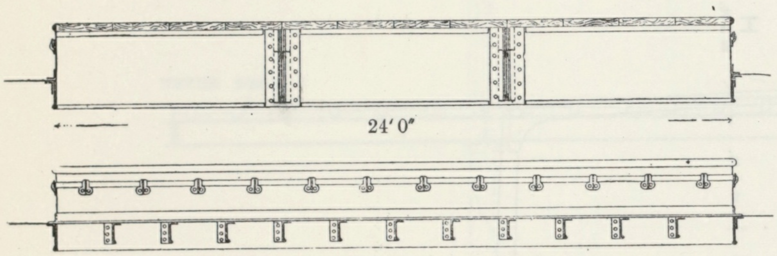
HATCHWAYS.

(Section 32.)

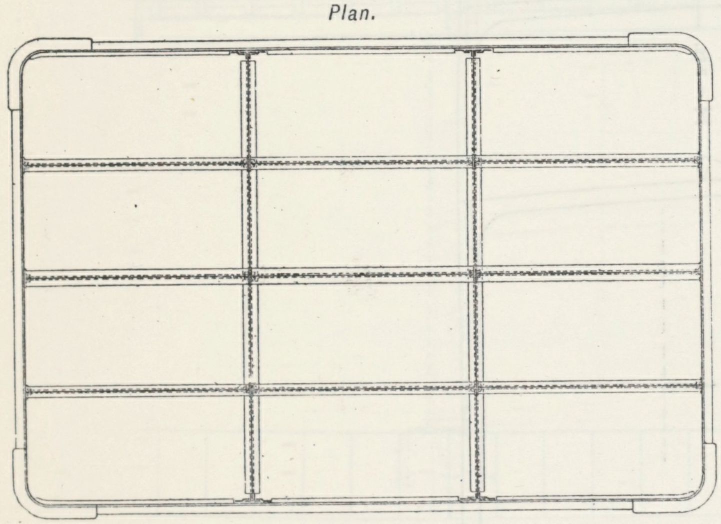
WEB PLATE BEAMS WITH FORE AND AFTERS.

Weather Deck Hatchways.

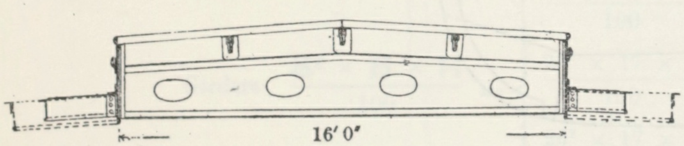
Elevations at Side.



Plan.

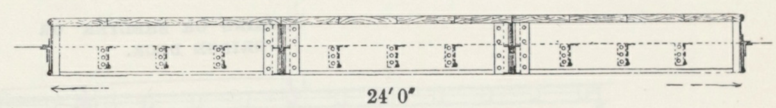


Sectional Elevation at Web Plate.

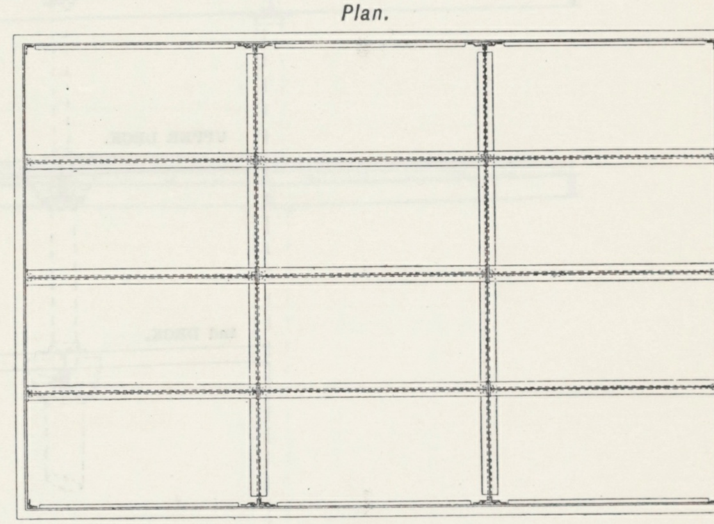


Hatchways below the Weather Deck.

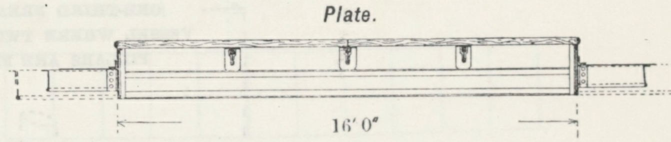
Elevation at Side.



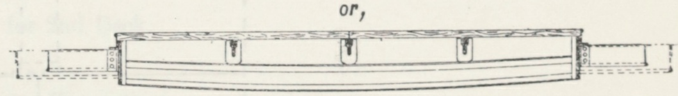
Plan.



Sectional Elevations at Web Plate.



or,



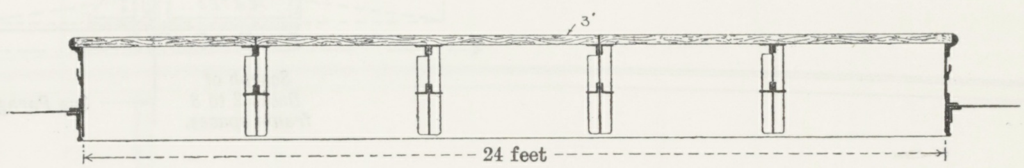
HATCHWAYS.

(Section 32.)

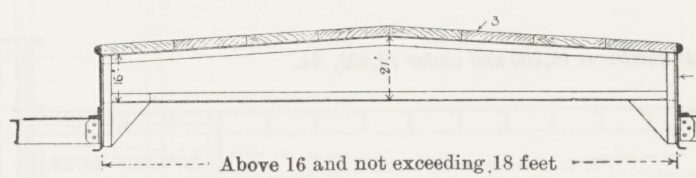
WEB PLATE BEAMS WITHOUT FORE AND AFTERS.

Weather Deck Hatchways.

Elevation at Side.

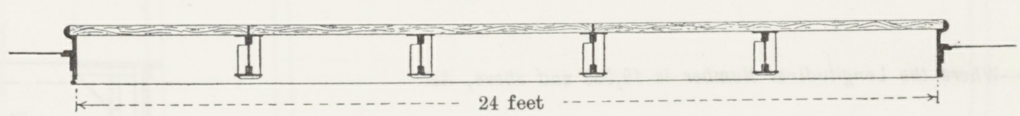


Sectional Elevation at Web Plates.

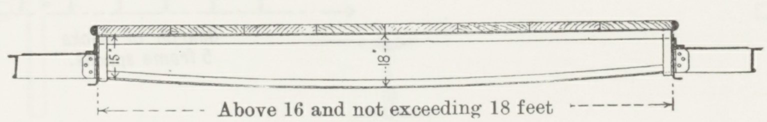


Hatchways Below the Weather Deck.

Elevation at Side.



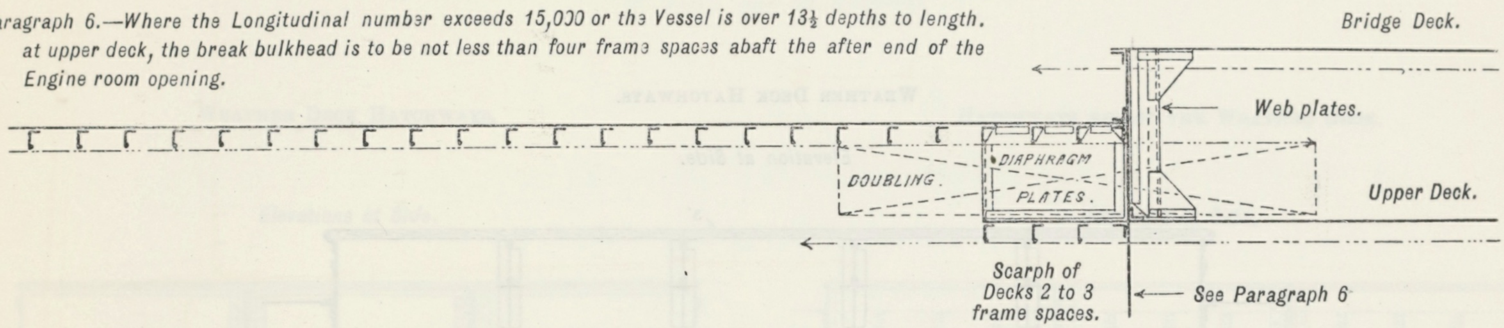
Sectional Elevation at Web Plates.



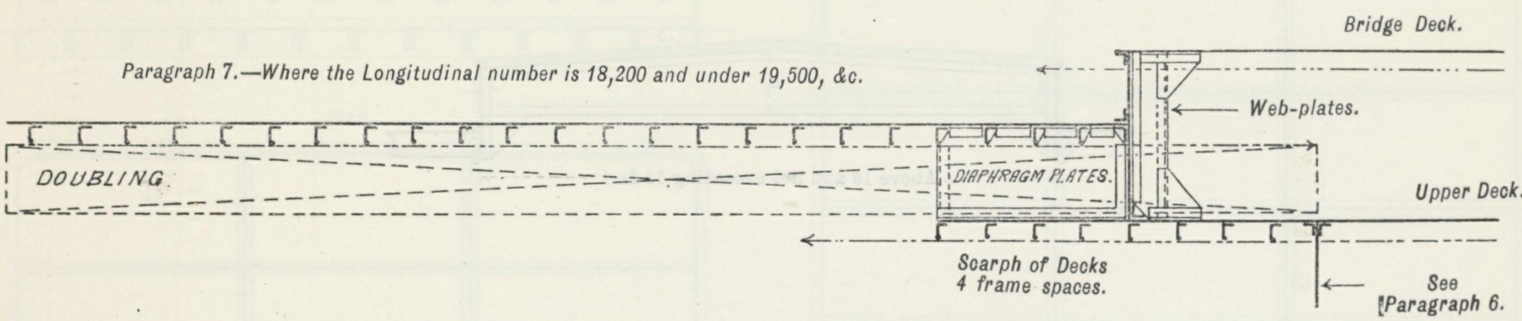
STRENGTHENING AT BREAK OF RAISED QUARTER DECK.

(Section 46, paragraphs 4, 5, 6 and 7.)

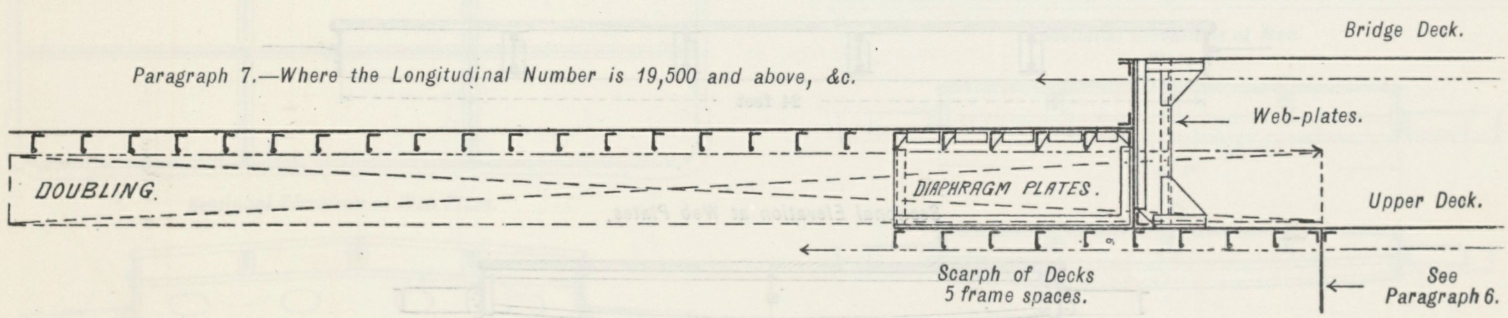
Paragraph 6.—Where the Longitudinal number exceeds 15,000 or the Vessel is over 13½ depths to length, at upper deck, the break bulkhead is to be not less than four frame spaces abaft the after end of the Engine room opening.



Paragraph 7.—Where the Longitudinal number is 18,200 and under 19,500, &c.



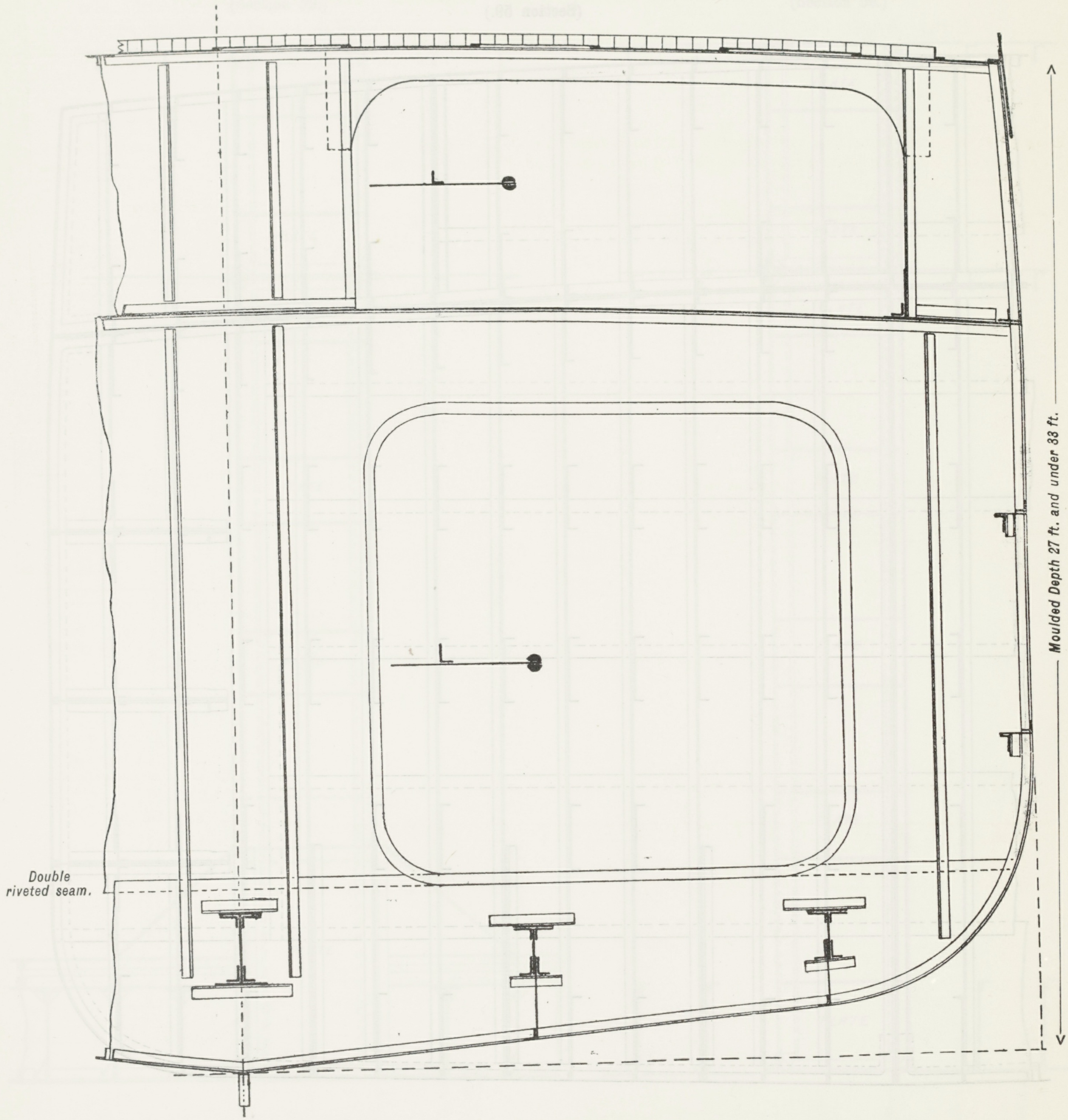
Paragraph 7.—Where the Longitudinal Number is 19,500 and above, &c.



PARTIAL BULKHEAD IN SAILING VESSELS.

WHERE THE MOULDED DEPTH IS 27 FEET AND UNDER 33 FEET.

(Section 47, paragraph 4.)

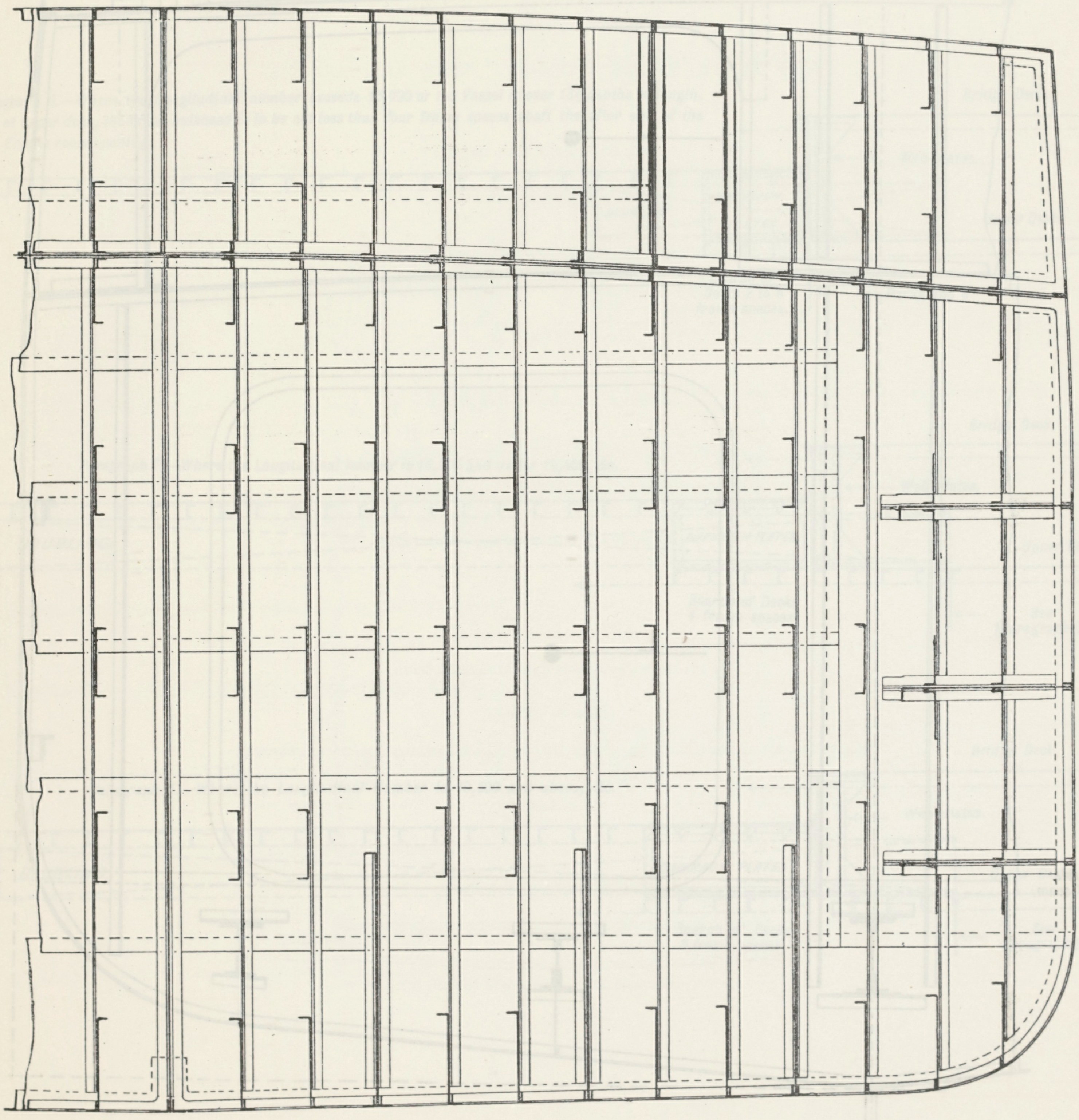


VESSELS INTENDED TO CARRY OIL IN BULK.

COFFERDAM BULKHEADS.

ARRANGEMENT OF STIFFENING INSIDE COFFERDAMS.

(Section 59.)

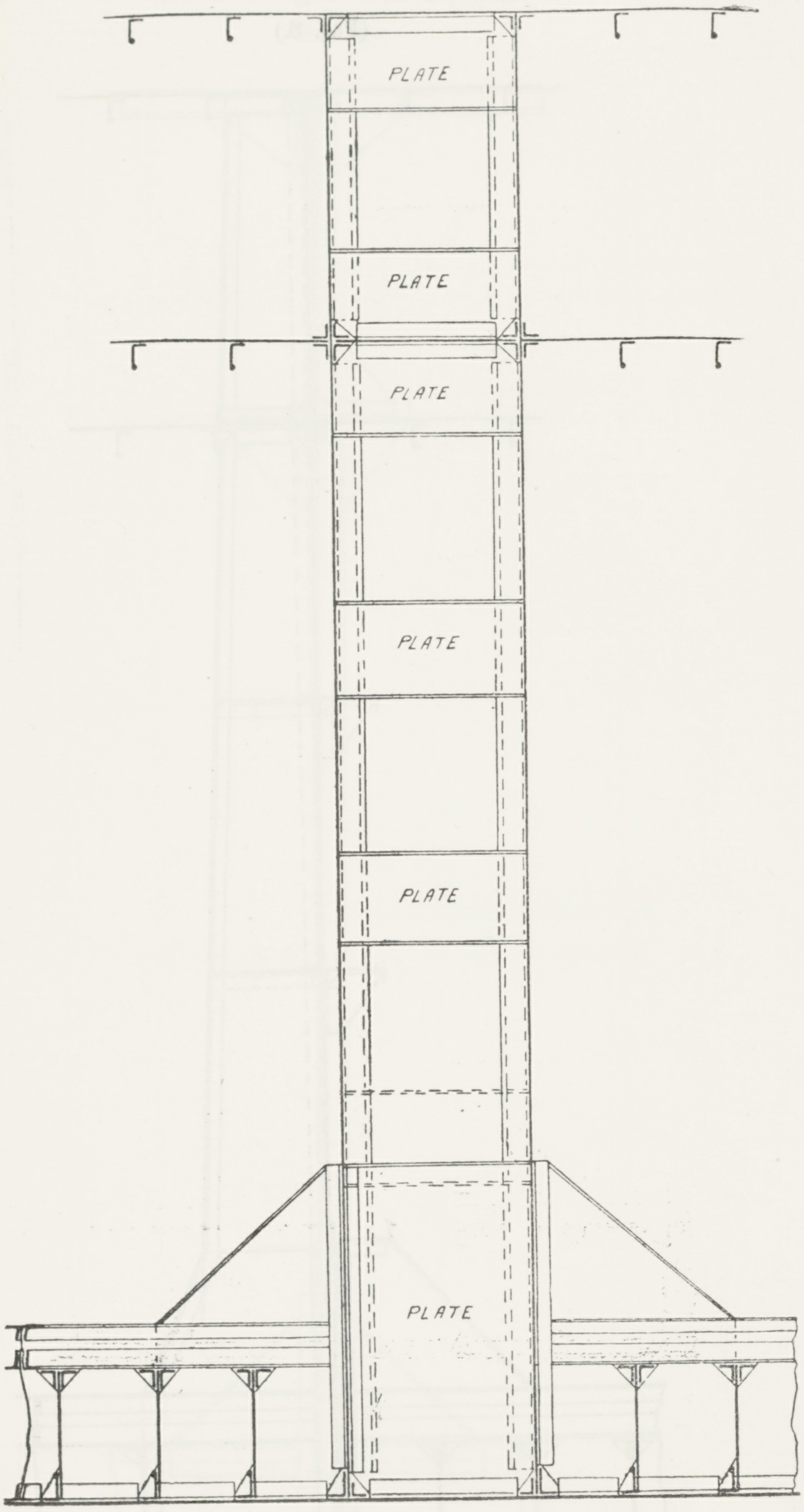


VESSELS INTENDED TO CARRY OIL IN BULK.

COFFERDAM BULKHEADS.

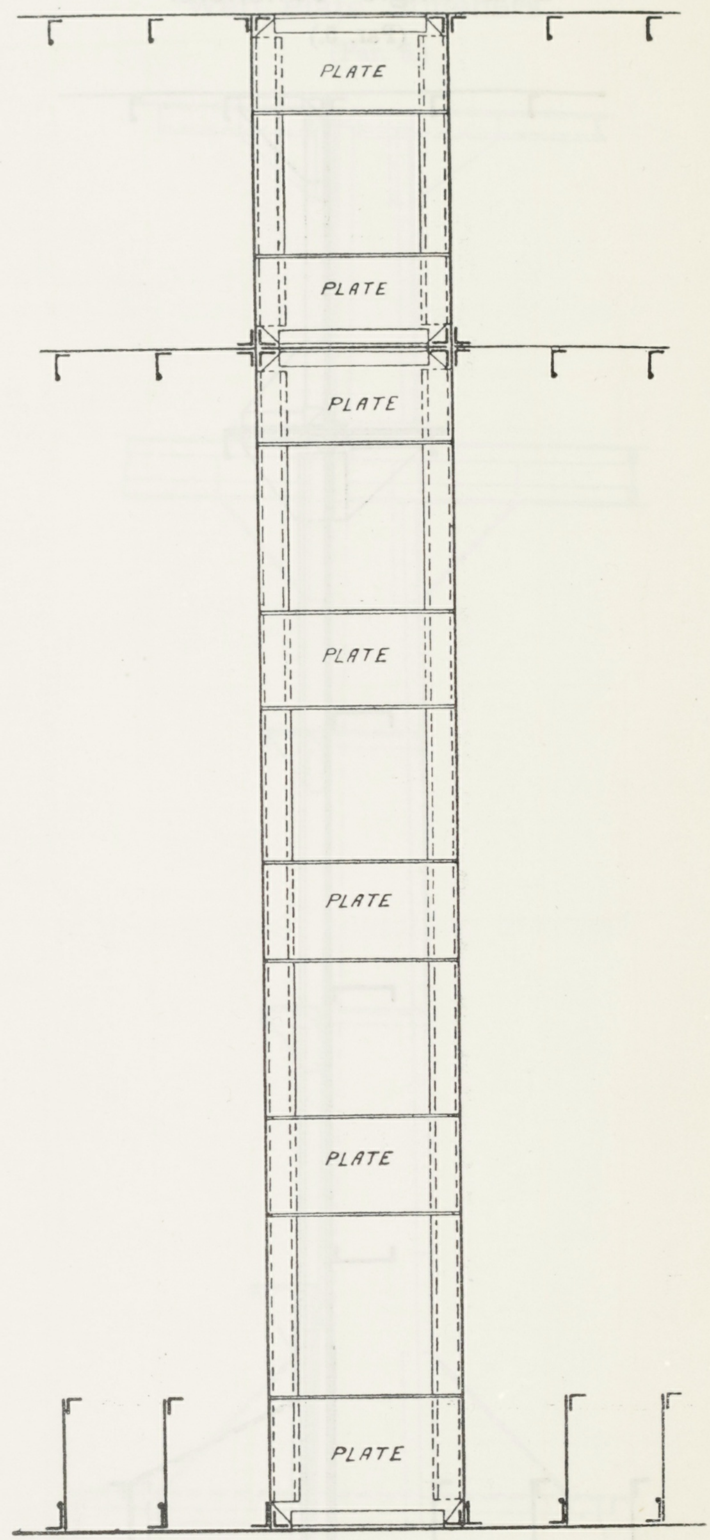
ARRANGEMENT OF STIFFENING INSIDE COFFERDAMS IN WAY OF KEELSONS.

(Section 59.)



ARRANGEMENT OF STIFFENING INSIDE COFFERDAMS CLEAR OF KEELSONS.

(Section 59.)



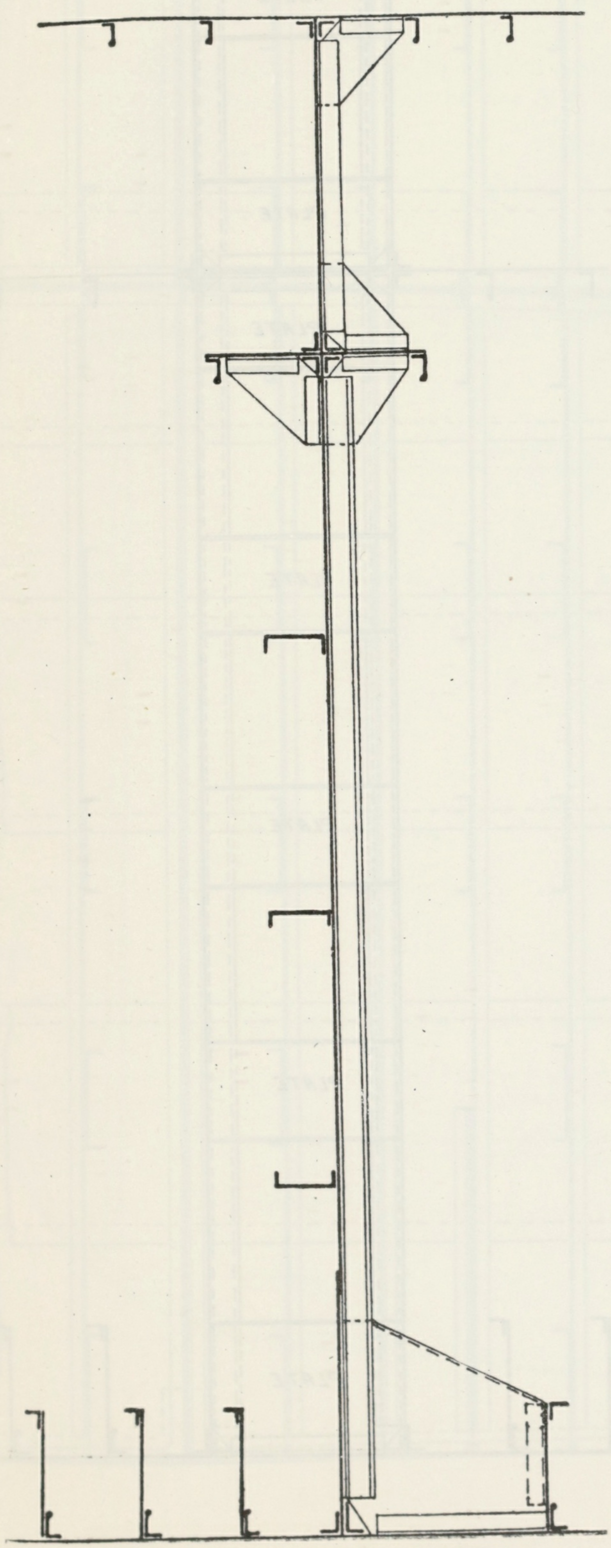
VESSELS INTENDED TO CARRY OIL IN BULK.

TRANSVERSE BULKHEAD.

(Section 58 and Table 35.)

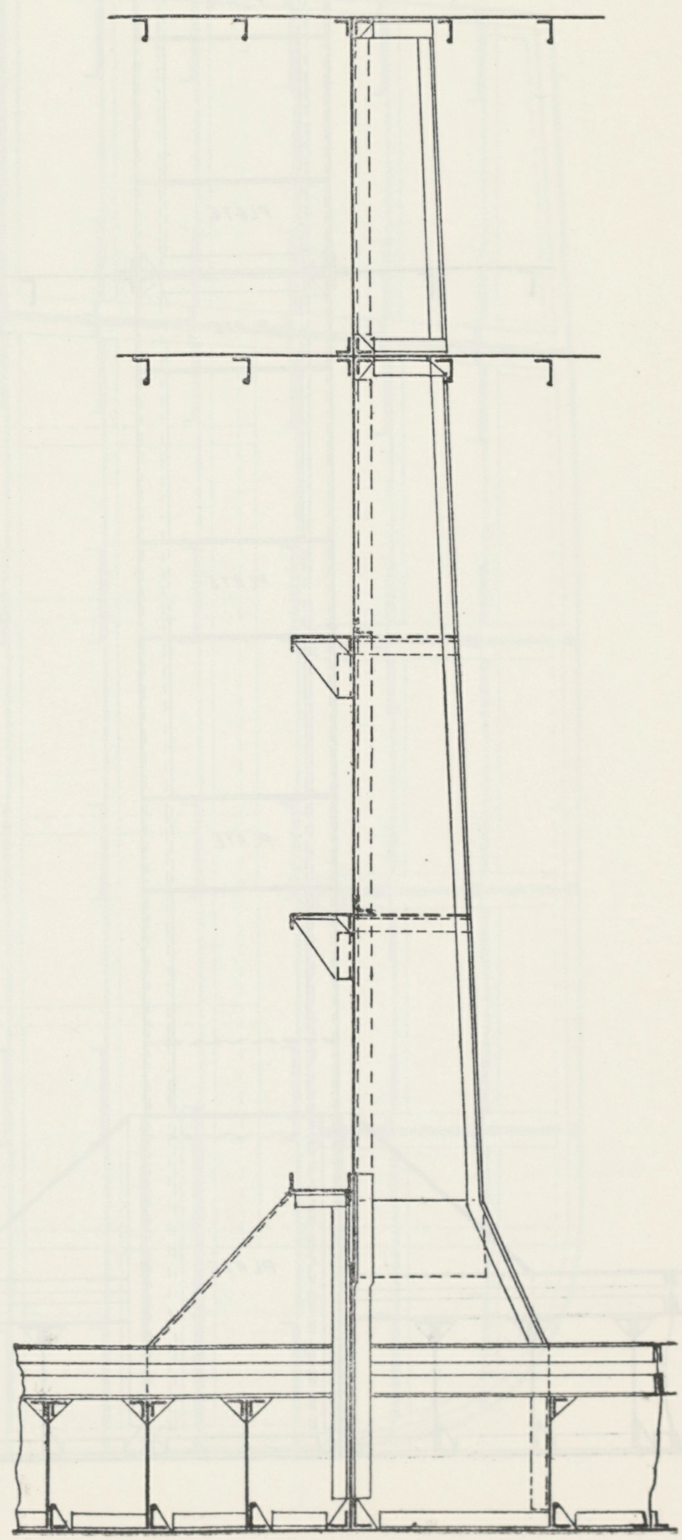
Bulb Angle Stiffeners.

(Par. 5.)



Web Plate Stiffeners.

(Par. 8.)



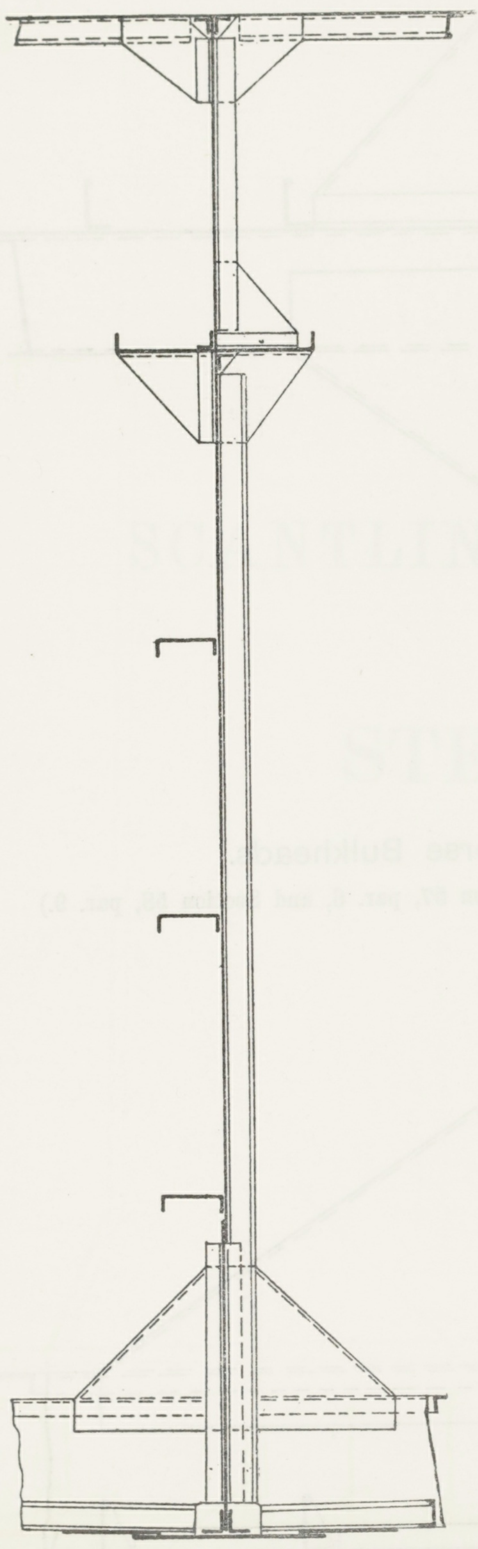
VESSELS INTENDED TO CARRY OIL IN BULK.

MIDDLE LINE BULKHEAD.

(Section 60 and Table 35.)

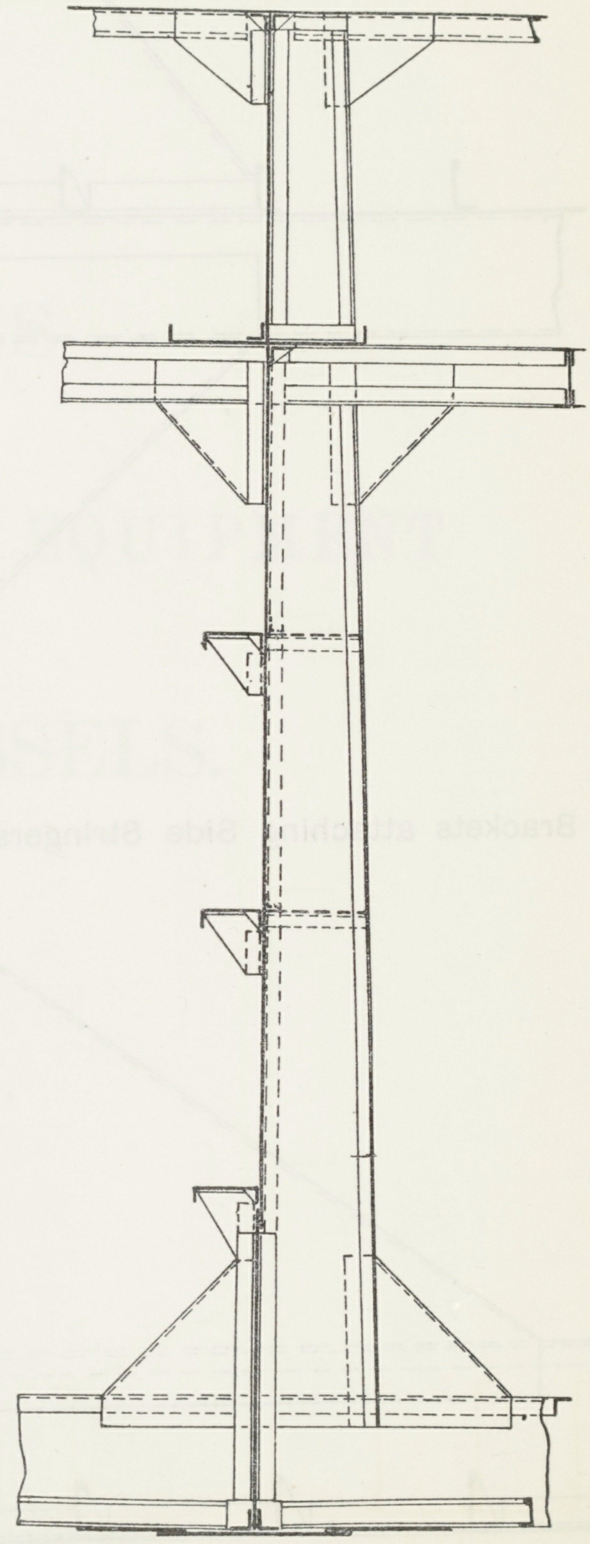
Bulb Angle Stiffeners.

(Par. 4.)



Web Plate Stiffeners.

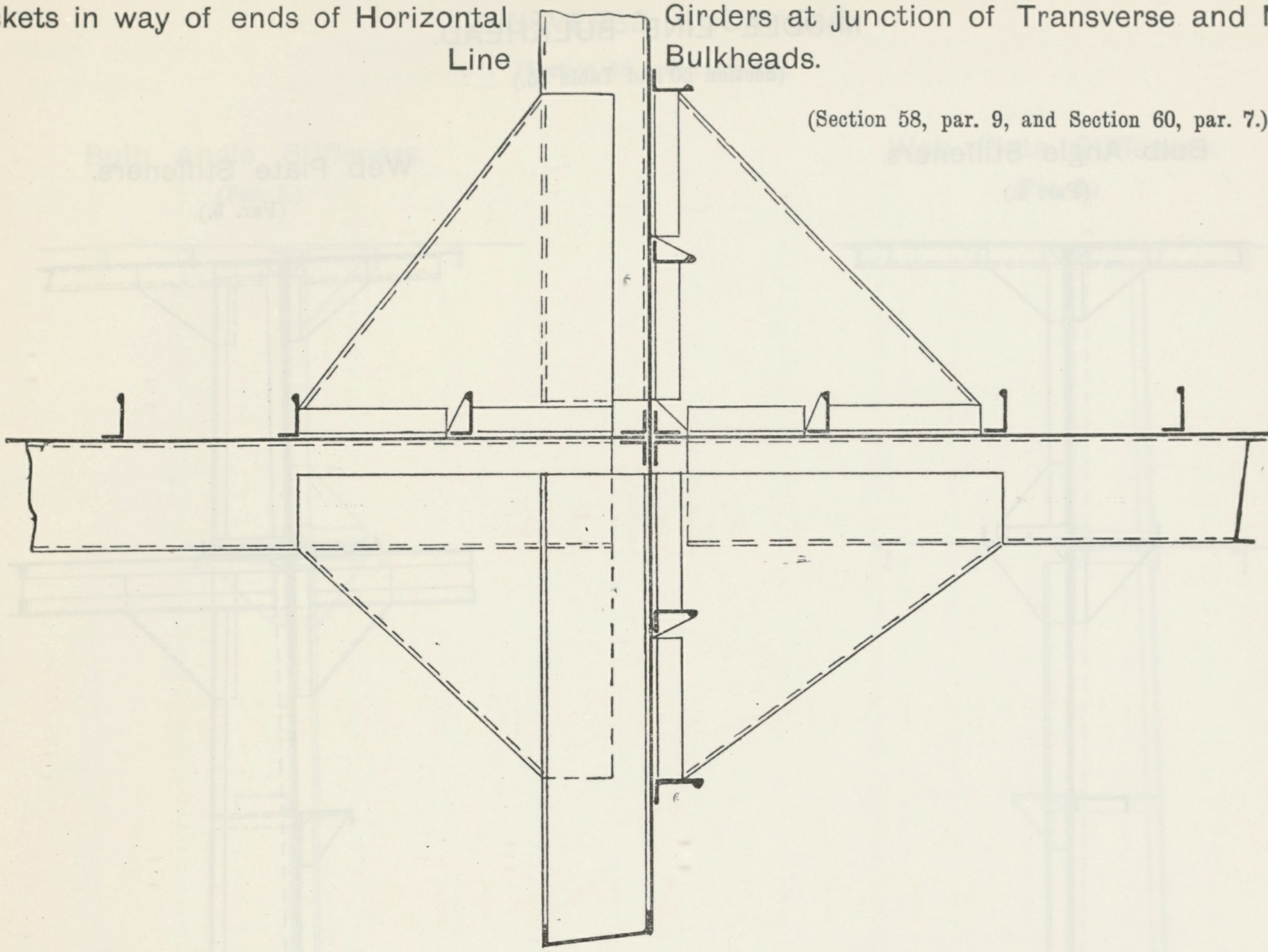
(Par. 5.)



VESSELS INTENDED TO CARRY OIL IN BULK.

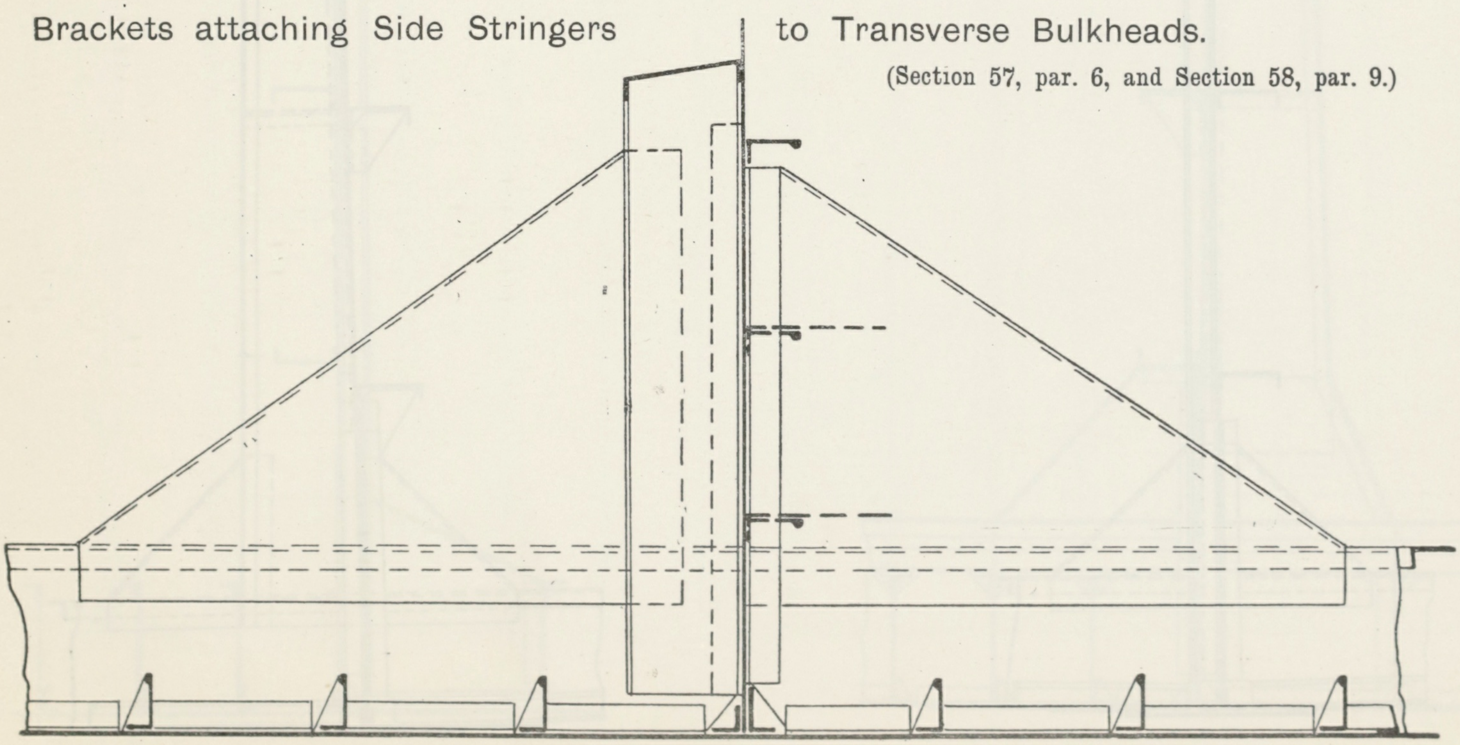
Brackets in way of ends of Horizontal Girders at junction of Transverse and Middle Line Bulkheads.

(Section 58, par. 9, and Section 60, par. 7.)



Brackets attaching Side Stringers to Transverse Bulkheads.

(Section 57, par. 6, and Section 58, par. 9.)



TABLES

OF

SCANTLINGS AND EQUIPMENT

FOR

STEEL VESSELS.

LONGITUDINAL NUMBER. L × (B + D).	KEELS.	STEMS.	STERN-POSTS WITHOUT APER-TURES.	STERN FRAMES WITH APERTURES.	
				Propeller Post.	Rudder Post.
	Inches.	Inches.	Inches.	Inches.	Inches.
2100 and under 2700	$6 \times 1\frac{1}{8}$	$5\frac{1}{4} \times 1\frac{1}{8}$	$5\frac{1}{4} \times 1\frac{1}{8}$	$5\frac{1}{4} \times 2\frac{1}{4}$	$5 \times 2\frac{1}{4}$
2700 and under 3350	$6\frac{1}{4} \times 1\frac{1}{4}$	$5\frac{1}{2} \times 1\frac{1}{4}$	$5\frac{1}{2} \times 1\frac{1}{4}$	$5\frac{1}{2} \times 2\frac{1}{2}$	$5\frac{1}{4} \times 2\frac{1}{2}$
3350 and under 4000	$6\frac{3}{4} \times 1\frac{1}{4}$	$5\frac{3}{4} \times 1\frac{1}{4}$	$5\frac{3}{4} \times 1\frac{1}{4}$	$5\frac{3}{4} \times 2\frac{3}{4}$	$5\frac{1}{2} \times 2\frac{3}{4}$
4000 and under 4650	$6\frac{3}{4} \times 1\frac{3}{8}$	$5\frac{3}{4} \times 1\frac{3}{8}$	$5\frac{3}{4} \times 1\frac{3}{8}$	$5\frac{3}{4} \times 3$	$5\frac{1}{2} \times 3$
4650 and under 5300	$7 \times 1\frac{1}{2}$	$6 \times 1\frac{1}{2}$	$6 \times 1\frac{1}{2}$	$6 \times 3\frac{1}{4}$	$5\frac{3}{4} \times 3\frac{1}{4}$
5300 and under 5950	$7 \times 1\frac{5}{8}$	$6 \times 1\frac{5}{8}$	$6 \times 1\frac{5}{8}$	$6 \times 3\frac{1}{2}$	$5\frac{3}{4} \times 3\frac{1}{2}$
5950 and under 6600	$7\frac{1}{4} \times 1\frac{3}{4}$	$6\frac{1}{4} \times 1\frac{5}{8}$	$6\frac{1}{4} \times 1\frac{3}{4}$	$6\frac{1}{4} \times 3\frac{3}{4}$	$5\frac{3}{4} \times 3\frac{3}{4}$
6600 and under 7250	$7\frac{1}{4} \times 1\frac{7}{8}$	$6\frac{1}{4} \times 1\frac{3}{4}$	$6\frac{1}{4} \times 1\frac{7}{8}$	$6\frac{1}{4} \times 4$	$5\frac{3}{4} \times 4$
7250 and under 7900	$7\frac{1}{4} \times 1\frac{7}{8}$	$6\frac{1}{4} \times 1\frac{3}{4}$	$6\frac{1}{4} \times 1\frac{7}{8}$	$6\frac{1}{4} \times 4\frac{1}{4}$	$5\frac{3}{4} \times 4\frac{1}{4}$
7900 and under 8550	$7\frac{1}{4} \times 2$	$6\frac{1}{4} \times 1\frac{7}{8}$	$6\frac{1}{4} \times 2$	$6\frac{1}{4} \times 4\frac{1}{2}$	$5\frac{3}{4} \times 4\frac{1}{2}$
8550 and under 9200	$7\frac{1}{2} \times 2\frac{1}{8}$	$6\frac{1}{2} \times 1\frac{7}{8}$	$6\frac{1}{2} \times 2\frac{1}{8}$	$6\frac{1}{2} \times 4\frac{1}{2}$	$6 \times 4\frac{1}{2}$
9200 and under 9850	$7\frac{1}{2} \times 2\frac{1}{4}$	$6\frac{1}{2} \times 2$	$6\frac{1}{2} \times 2\frac{1}{4}$	$6\frac{1}{2} \times 4\frac{3}{4}$	$6 \times 4\frac{3}{4}$
9850 and under 10500	$7\frac{3}{4} \times 2\frac{1}{4}$	$6\frac{3}{4} \times 2$	$6\frac{3}{4} \times 2\frac{1}{4}$	$6\frac{3}{4} \times 4\frac{3}{4}$	$6 \times 4\frac{3}{4}$
10500 and under 11150	$7\frac{3}{4} \times 2\frac{3}{8}$	$6\frac{3}{4} \times 2\frac{1}{8}$	$6\frac{3}{4} \times 2\frac{3}{8}$	$6\frac{3}{4} \times 5$	6×5
11150 and under 11800	$8 \times 2\frac{3}{8}$	$7 \times 2\frac{1}{8}$	$7 \times 2\frac{3}{8}$	7×5	$6\frac{1}{4} \times 5$
11800 and under 12500	$8\frac{1}{4} \times 2\frac{3}{8}$	$7\frac{1}{4} \times 2\frac{1}{8}$	$7\frac{1}{4} \times 2\frac{3}{8}$	$7\frac{1}{4} \times 5$	$6\frac{1}{2} \times 5$
12500 and under 13300	$8\frac{1}{4} \times 2\frac{1}{2}$	$7\frac{1}{4} \times 2\frac{1}{4}$	$7\frac{1}{4} \times 2\frac{1}{2}$	$7\frac{1}{4} \times 5\frac{1}{4}$	$6\frac{1}{2} \times 5\frac{1}{4}$
13300 and under 14200	$8\frac{1}{2} \times 2\frac{1}{2}$	$7\frac{1}{2} \times 2\frac{1}{4}$	$7\frac{1}{2} \times 2\frac{1}{2}$	$7\frac{1}{2} \times 5\frac{1}{4}$	$6\frac{3}{4} \times 5\frac{1}{4}$
14200 and under 15200	$8\frac{1}{2} \times 2\frac{5}{8}$	$7\frac{1}{2} \times 2\frac{3}{8}$	$7\frac{1}{2} \times 2\frac{5}{8}$	$7\frac{1}{2} \times 5\frac{1}{2}$	$6\frac{3}{4} \times 5\frac{1}{2}$
15200 and under 16300	$9 \times 2\frac{5}{8}$	$8 \times 2\frac{3}{8}$	$8 \times 2\frac{5}{8}$	$8 \times 5\frac{1}{2}$	$7 \times 5\frac{1}{2}$
16300 and under 17500	$9\frac{1}{2} \times 2\frac{5}{8}$	$8\frac{1}{2} \times 2\frac{3}{8}$	$8\frac{1}{2} \times 2\frac{5}{8}$	$8\frac{1}{2} \times 5\frac{1}{2}$	$7\frac{1}{2} \times 5\frac{1}{2}$
17500 and under 18900	$10 \times 2\frac{5}{8}$	$9 \times 2\frac{3}{8}$	$9 \times 2\frac{5}{8}$	$9 \times 5\frac{1}{2}$	$8 \times 5\frac{1}{2}$
18900 and under 20500	$10 \times 2\frac{3}{4}$	$9 \times 2\frac{1}{2}$	$9 \times 2\frac{3}{4}$	9×6	8×6
20500 and under 22300	$10\frac{1}{2} \times 2\frac{3}{4}$	$9\frac{1}{2} \times 2\frac{1}{2}$	$9\frac{1}{2} \times 2\frac{3}{4}$	$9\frac{1}{2} \times 6$	$8\frac{1}{2} \times 6$
22300 and under 24300	$10\frac{1}{2} \times 2\frac{3}{4}$	$9\frac{1}{2} \times 2\frac{1}{2}$	$9\frac{1}{2} \times 2\frac{3}{4}$	$9\frac{1}{2} \times 6\frac{1}{2}$	$8\frac{1}{2} \times 6\frac{1}{2}$
24300 and under 26500	$11 \times 2\frac{3}{4}$	$10 \times 2\frac{1}{2}$	$10 \times 2\frac{3}{4}$	$10 \times 6\frac{1}{2}$	$9 \times 6\frac{1}{2}$
26500 and under 28900	$11 \times 2\frac{7}{8}$	$10 \times 2\frac{5}{8}$	$10 \times 2\frac{7}{8}$	10×7	9×7
28900 and under 31500	$11\frac{1}{2} \times 2\frac{7}{8}$	$10 \times 2\frac{3}{4}$	10×3	$10 \times 7\frac{1}{2}$	$9 \times 7\frac{1}{2}$
31500 and under 34300	$11\frac{1}{2} \times 3$	$10\frac{1}{2} \times 2\frac{3}{4}$	$10\frac{1}{2} \times 3$	$10\frac{1}{2} \times 7\frac{1}{2}$	$9 \times 7\frac{1}{2}$
34300 and under 37300	12×3	$10\frac{1}{2} \times 2\frac{3}{4}$	$10\frac{1}{2} \times 3\frac{1}{8}$	$10\frac{1}{2} \times 8$	9×8
37300 and under 40500	—	$10\frac{1}{2} \times 2\frac{7}{8}$	$10\frac{1}{2} \times 3\frac{1}{4}$	$10\frac{1}{2} \times 8\frac{1}{2}$	$9 \times 8\frac{1}{2}$
40500 and under 43900	—	$11 \times 2\frac{7}{8}$	$11 \times 3\frac{1}{4}$	$11 \times 8\frac{1}{2}$	$9\frac{1}{2} \times 8\frac{1}{2}$
43900 and under 47500	—	11×3	$11 \times 3\frac{3}{8}$	11×9	$9\frac{1}{2} \times 9$
47500 and under 51300	—	$11 \times 3\frac{1}{8}$	$11 \times 3\frac{1}{2}$	$11 \times 9\frac{1}{2}$	$9\frac{1}{2} \times 9\frac{1}{2}$
51300 and under 55300	—	$11\frac{1}{2} \times 3\frac{1}{8}$	$11\frac{1}{2} \times 3\frac{1}{2}$	$11\frac{1}{2} \times 9\frac{1}{2}$	$10 \times 9\frac{1}{2}$
55300 and under 59700	—	$11\frac{1}{2} \times 3\frac{1}{8}$	$11\frac{1}{2} \times 3\frac{5}{8}$	$11\frac{1}{2} \times 10$	10×10
59700 and under 64500	—	$11\frac{1}{2} \times 3\frac{1}{4}$	$11\frac{1}{2} \times 3\frac{3}{4}$	12×10	$10\frac{1}{2} \times 10$
64500 and under 69700	—	$12 \times 3\frac{1}{4}$	$12 \times 3\frac{3}{4}$	$12 \times 10\frac{1}{2}$	$10\frac{1}{2} \times 10\frac{1}{2}$
69700 and under 75300	—	$12 \times 3\frac{3}{8}$	$12 \times 3\frac{7}{8}$	$12\frac{1}{2} \times 10\frac{1}{2}$	$11 \times 10\frac{1}{2}$
75300 and under 81000	—	$12 \times 3\frac{1}{2}$	12×4	$12\frac{1}{2} \times 11$	11×11

The sectional area of the sole piece of stern frame is to be increased 15 per cent. beyond the sectional area of the propeller post.

The thickness of the sides of the boss of the propeller post is to be not less than three-fifths that required by the Table for the propeller post.

In high powered single screw vessels the dimensions of the stern frame will require to be increased to the satisfaction of the Committee.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.—*17th June, 1909.*

FRAMES with SINGLE REVERSED FRAMES.

TABLE 2.

(See Continuation.)

TRANSVERSE NUMBER. B + D	FRAME SPACING.		FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS AT SIDE. *See* SKETCH ON PAGE 21.					
				Feet. 7 and under 8	Feet. 8 and under 9	Feet. 9 and under 10	Feet. 10 and under 11	Feet. 11 and under 12	Feet. 12 and under 13
				<— ONE SIDE STRINGER. —>					
Feet.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.
23 and under 25	20	Frames	2¼ × 2¼ × ·22	2¼ × 2¼ × ·22	2½ × 2½ × ·22	2½ × 2½ × ·24	2½ × 2½ × ·24		
		Reversed frames	2¼ × 2¼ × ·22	2¼ × 2¼ × ·22	2¼ × 2¼ × ·22	2¼ × 2¼ × ·22	2¼ × 2¼ × ·24		
		Depth of framing	2¼	2¼	2½	2½	2½		
25 and under 27	20	Frames	2½ × 2½ × ·22	2½ × 2½ × ·22	2½ × 2½ × ·24	2½ × 2½ × ·24	3 × 2½ × ·24	3 × 2½ × ·24	
		Reversed frames	2¼ × 2¼ × ·22	2¼ × 2¼ × ·22	2¼ × 2¼ × ·22	2¼ × 2¼ × ·24	2¼ × 2¼ × ·24	2½ × 2½ × ·24	
		Depth of framing	2½	2½	2½	2½	3	3	
27 and under 29	20½	Frames	2½ × 2½ × ·24	2½ × 2½ × ·24	2½ × 2½ × ·24	3 × 2½ × ·24	3 × 2½ × ·24	3 × 2½ × ·26	3 × 3 × ·26
		Reversed frames	2¼ × 2¼ × ·22	2¼ × 2¼ × ·22	2¼ × 2¼ × ·24	2¼ × 2¼ × ·24	2½ × 2½ × ·24	2½ × 2½ × ·26	2½ × 2½ × ·26
		Depth of framing	2½	2½	2½	3	3	3	3
29 and under 31	20½	Frames	2½ × 2½ × ·24	2½ × 2½ × ·24	3 × 2½ × ·24	3 × 2½ × ·24	3 × 2½ × ·26	3 × 3 × ·26	3 × 3 × ·28
		Reversed frames	2¼ × 2¼ × ·24	2¼ × 2¼ × ·24	2¼ × 2¼ × ·24	2½ × 2½ × ·24	2½ × 2½ × ·26	2½ × 2½ × ·26	2½ × 2½ × ·28
		Depth of framing	2½	2½	3	3	3	3	3
31 and under 33	21	Frames	3 × 2½ × ·24	3 × 2½ × ·24	3 × 2½ × ·24	3 × 2½ × ·26	3 × 3 × ·26	3 × 3 × ·28	3½ × 3 × ·28
		Reversed frames	2¼ × 2¼ × ·24	2¼ × 2¼ × ·24	2½ × 2½ × ·24	2½ × 2½ × ·26	2½ × 2½ × ·26	2½ × 2½ × ·28	2½ × 2½ × ·28
		Depth of framing	3	3	3	3	3	3	3½
33 and under 35	21	Frames	3 × 2½ × ·24	3 × 2½ × ·24	3 × 2½ × ·26	3 × 3 × ·26	3 × 3 × ·28	3½ × 3 × ·28	3½ × 3 × ·30
		Reversed frames	2½ × 2½ × ·24	2½ × 2½ × ·24	2½ × 2½ × ·26	2½ × 2½ × ·26	2½ × 2½ × ·28	2½ × 2½ × ·28	2½ × 2½ × ·30
		Depth of framing	3	3	3	3	3	3½	3½
35 and under 37	21½	Frames	3 × 2½ × ·26	3 × 2½ × ·26	3 × 3 × ·26	3 × 3 × ·28	3½ × 3 × ·28	3½ × 3 × ·30	3½ × 3 × ·30
		Reversed frames	2½ × 2½ × ·26	2½ × 2½ × ·26	2½ × 2½ × ·26	2½ × 2½ × ·28	2½ × 2½ × ·28	2½ × 2½ × ·30	3 × 2½ × ·30
		Depth of framing	3	3	3	3	3½	3½	3½
37 and under 39	21½	Frames	3 × 3 × ·26	3 × 3 × ·26	3 × 3 × ·28	3½ × 3 × ·28	3½ × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·30
		Reversed frames	2½ × 2½ × ·26	2½ × 2½ × ·26	2½ × 2½ × ·28	2½ × 2½ × ·28	2½ × 2½ × ·30	3 × 2½ × ·30	3 × 3 × ·30
		Depth of framing	3	3	3	3½	3½	3½	3½
39 and under 42	22	Frames	3 × 3 × ·28	3 × 3 × ·28	3½ × 3 × ·28	3½ × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·30	4 × 3 × ·30
		Reversed frames	2½ × 2½ × ·28	2½ × 2½ × ·28	2½ × 2½ × ·28	2½ × 2½ × ·30	3 × 2½ × ·30	3 × 3 × ·30	3 × 3 × ·30
		Depth of framing	3	3	3½	3½	3½	3½	4
42 and under 45	22	Frames	3½ × 3 × ·28	3½ × 3 × ·28	3½ × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·30	4 × 3 × ·30	4 × 3 × ·30
		Reversed frames	2½ × 2½ × ·28	2½ × 2½ × ·28	2½ × 2½ × ·30	3 × 2½ × ·30	3 × 3 × ·30	3 × 3 × ·30	3½ × 3 × ·30
		Depth of framing	3½	3½	3½	3½	3½	4	4½
45 and under 48	22½	Frames	3½ × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·30	4 × 3 × ·30	4 × 3 × ·30	4 × 3 × ·32
		Reversed frames	2½ × 2½ × ·30	2½ × 2½ × ·30	3 × 2½ × ·30	3 × 3 × ·30	3 × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·32
		Depth of framing	3½	3½	3½	3½	4	4½	4½
48 and under 51	22½	Frames	3½ × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·30	4 × 3 × ·30	4 × 3 × ·30	4 × 3 × ·32	4 × 3 × ·32
		Reversed frames	3 × 2½ × ·30	3 × 2½ × ·30	3 × 3 × ·30	3 × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·32	4 × 3 × ·32
		Depth of framing	3½	3½	3½	4	4½	4½	5
51 and under 54	23	Frames	3½ × 3 × ·30	3½ × 3 × ·30	4 × 3 × ·30	4 × 3 × ·30	4 × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34
		Reversed frames	3 × 3 × ·30	3 × 3 × ·30	3 × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34
		Depth of framing	3½	3½	4	4½	4½	5	5
54 and under 57	23	Frames	4 × 3 × ·30	4 × 3 × ·30	4 × 3 × ·30	4 × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34	4 × 3 × ·34
		Reversed frames	3 × 3 × ·30	3 × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34	4½ × 3 × ·34
		Depth of framing	4	4	4½	4½	5	5	5½
57 and under 60	23½	Frames	4½ × 3 × ·30	4½ × 3 × ·30	4½ × 3 × ·32	4½ × 3 × ·32	4½ × 3 × ·34	4½ × 3 × ·34	4½ × 3 × ·36
		Reversed frames	3 × 3 × ·30	3 × 3 × ·30	3 × 3 × ·32	3½ × 3 × ·32	3½ × 3 × ·34	4 × 3 × ·34	4 × 3 × ·36
		Depth of framing	4½	4½	4½	5	5	5½	5½

FRAMES with SINGLE REVERSED FRAMES.

TABLE 2.
(See Continuation.)

TRANSVERSE NUMBER. B + D	FRAME SPACING.		DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS AT SIDE. *See* SKETCH ON PAGE 21.						
			Feet. 13 and under 14	Feet. 14 and under 15	Feet. 15 and under 16	Feet. 16 and under 17	Feet. 17 and under 18	Feet. 18 and under 19	Feet. 19 and under 20
			ONE SIDE STRINGER.	<— TWO SIDE STRINGERS. —>					
Feet.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.
23 and under 25	20	Frames							
		Reversed frames							
		Depth of framing							
25 and under 27	20	Frames							
		Reversed frames							
		Depth of framing							
27 and under 29	20½	Frames							
		Reversed frames							
		Depth of framing							
29 and under 31	20½	Frames	3½ × 3 × ·28						
		Reversed frames	2½ × 2½ × ·28						
		Depth of framing	3½						
31 and under 33	21	Frames	3½ × 3 × ·30	3½ × 3 × ·30					
		Reversed frames	2½ × 2½ × ·30	3 × 2½ × ·30					
		Depth of framing	3½	3½					
33 and under 35	21	Frames	3½ × 3 × ·30	3½ × 3 × ·30	4 × 3 × ·30				
		Reversed frames	3 × 2½ × ·30	3 × 3 × ·30	3 × 3 × ·30				
		Depth of framing	3½	3½	4				
35 and under 37	21½	Frames	3½ × 3 × ·30	4 × 3 × ·30	4 × 3 × ·30	4 × 3 × ·32			
		Reversed frames	3 × 3 × ·30	3 × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·32			
		Depth of framing	3½	4	4½	4½			
37 and under 39	21½	Frames	4 × 3 × ·30	4 × 3 × ·30	4 × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34		
		Reversed frames	3 × 3 × ·30	3½ × 3 × ·30	3½ × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34		
		Depth of framing	4	4½	4½	5	5		
39 and under 42	22	Frames	4 × 3 × ·30	4 × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34	4 × 3 × ·34	4 × 3 × ·36	
		Reversed frames	3½ × 3 × ·30	3½ × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34	4½ × 3 × ·34	4½ × 3 × ·36	
		Depth of framing	4½	4½	5	5	5½	5½	
42 and under 45	22	Frames	4 × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34	4 × 3 × ·34	4 × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38
		Reversed frames	3½ × 3 × ·32	4 × 3 × ·32	4 × 3 × ·34	4½ × 3 × ·34	4½ × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38
		Depth of framing	4½	5	5	5½	5½	6	6
45 and under 48	22½	Frames	4 × 3 × ·32	4 × 3 × ·34	4 × 3 × ·34	4 × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38	4½ × 3 × ·38
		Reversed frames	4 × 3 × ·32	4 × 3 × ·34	4½ × 3 × ·34	4½ × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38	5 × 3 × ·38
		Depth of framing	5	5	5½	5½	6	6	6½
48 and under 51	22½	Frames	4 × 3 × ·34	4 × 3 × ·34	4 × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38	4½ × 3 × ·38	4½ × 3 × ·40
		Reversed frames	4 × 3 × ·34	4½ × 3 × ·34	4½ × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38	5 × 3 × ·38	5 × 3 × ·40
		Depth of framing	5	5½	5½	6	6	6½	6½
51 and under 54	23	Frames	4 × 3 × ·34	4 × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38	4½ × 3 × ·38	4½ × 3 × ·40	5 × 3 × ·40
		Reversed frames	4½ × 3 × ·34	4½ × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38	5 × 3 × ·38	5 × 3 × ·40	5 × 3 × ·40
		Depth of framing	5½	5½	6	6	6½	6½	7
54 and under 57	23	Frames	4 × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38	4½ × 3 × ·38	4½ × 3 × ·40	5 × 3 × ·40	5 × 3 × ·42
		Reversed frames	4½ × 3 × ·36	4½ × 3 × ·36	4½ × 3 × ·38	5 × 3 × ·38	5 × 3 × ·40	5 × 3 × ·40	5 × 3 × ·42
		Depth of framing	5½	6	6	6½	6½	7	7
57 and under 60	23½	Frames	4½ × 3 × ·36	4½ × 3 × ·38	4½ × 3 × ·38	4½ × 3 × ·40	5 × 3 × ·40	5 × 3 × ·42	5 × 3 × ·42
		Reversed frames	4½ × 3 × ·36	4½ × 3 × ·38	5 × 3 × ·38	5 × 3 × ·40	5 × 3 × ·40	5 × 3 × ·42	5½ × 3 × ·42
		Depth of framing	6	6	6½	6½	7	7	7½

FRAMES with SINGLE REVERSED FRAMES.

TABLE 2.

(See Continuation.)

TRANSVERSE NUMBER. B + D	FRAME SPACING.		DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS AT SIDE. *See* SKETCH ON PAGE 21.						
			Feet. 20 and under 21	Feet. 21 and under 22	Feet. 22 and under 23	Feet. 23 and under 24	Feet. 24 and under 25	Feet. 25 and under 26	Feet. 26 and under 27
			TWO SIDE STRINGERS.	<——— THREE SIDE STRINGERS. ———>					
Feet.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.
23 and under 25	20	Frames							
		Reversed frames ..							
		Depth of framing ..							
25 and under 27	20	Frames							
		Reversed frames ..							
		Depth of framing ..							
27 and under 29	$20\frac{1}{2}$	Frames							
		Reversed frames ..							
		Depth of framing ..							
29 and under 31	$20\frac{1}{2}$	Frames							
		Reversed frames ..							
		Depth of framing ..							
31 and under 33	21	Frames							
		Reversed frames ..							
		Depth of framing ..							
33 and under 35	21	Frames							
		Reversed frames ..							
		Depth of framing ..							
35 and under 37	$21\frac{1}{2}$	Frames							
		Reversed frames ..							
		Depth of framing ..							
37 and under 39	$21\frac{1}{2}$	Frames							
		Reversed frames ..							
		Depth of framing ..							
39 and under 42	22	Frames							
		Reversed frames ..							
		Depth of framing ..							
42 and under 45	22	Frames							
		Reversed frames ..							
		Depth of framing ..							
45 and under 48	$22\frac{1}{2}$	Frames	$4\frac{1}{2} \times 3 \times \cdot 40$						
		Reversed frames ..	$5 \times 3 \times \cdot 40$						
		Depth of framing ..	$6\frac{1}{2}$						
48 and under 51	$22\frac{1}{2}$	Frames	$5 \times 3 \times \cdot 40$	$5 \times 3 \times \cdot 42$					
		Reversed frames ..	$5 \times 3 \times \cdot 40$	$5 \times 3 \times \cdot 42$					
		Depth of framing ..	7	7					
51 and under 54	23	Frames	$5 \times 3 \times \cdot 42$	$5 \times 3 \times \cdot 42$	$5\frac{1}{2} \times 3 \times \cdot 44$				
		Reversed frames ..	$5 \times 3 \times \cdot 42$	$5\frac{1}{2} \times 3 \times \cdot 42$	$5\frac{1}{2} \times 3 \times \cdot 44$				
		Depth of framing ..	7	$7\frac{1}{2}$	8				
54 and under 57	23	Frames	$5 \times 3 \times \cdot 42$	$5 \times 3 \times \cdot 44$	$5\frac{1}{2} \times 3 \times \cdot 46$	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$			
		Reversed frames ..	$5\frac{1}{2} \times 3 \times \cdot 42$	$5\frac{1}{2} \times 3 \times \cdot 44$	$5\frac{1}{2} \times 3 \times \cdot 46$	$6 \times 3\frac{1}{2} \times \cdot 46$			
		Depth of framing ..	$7\frac{1}{2}$	$7\frac{1}{2}$	8	$8\frac{1}{2}$			
57 and under 60	$23\frac{1}{2}$	Frames	$5 \times 3 \times \cdot 44$	$5\frac{1}{2} \times 3 \times \cdot 44$	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$6 \times 3\frac{1}{2} \times \cdot 48$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$		
		Reversed frames ..	$5\frac{1}{2} \times 3 \times \cdot 44$	$5\frac{1}{2} \times 3 \times \cdot 44$	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$6 \times 3\frac{1}{2} \times \cdot 48$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$		
		Depth of framing ..	$7\frac{1}{2}$	8	8	$8\frac{1}{2}$	$9\frac{1}{2}$		

FRAMES with SINGLE REVERSED FRAMES.

TABLE 2.

(See Continuation.)

TRANSVERSE NUMBER. B + D	FRAME SPACING.†		FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS AT SIDE. See SKETCH ON PAGE 21. Feet. 7 and under 8	Feet. 8 and under 9	Feet. 9 and under 10	Feet. 10 and under 11	Feet. 11 and under 12	Feet. 12 and under 13
				<——ONE SIDE STRINGER.——>					
Feet.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.
60 and under 63	23½	Frames	4½ × 3 × ·32	4½ × 3 × ·32	4½ × 3 × ·32	4½ × 3 × ·34	4½ × 3 × ·34	4½ × 3 × ·36	4½ × 3 × ·36
		Reversed frames ..	3 × 3 × ·32	3 × 3 × ·32	3½ × 3 × ·32	3½ × 3 × ·34	4 × 3 × ·34	4 × 3 × ·36	4½ × 3 × ·36
		Depth of framing ..	4½	4½	5	5	5½	5½	6
63 and under 66	24	Frames	5 × 3 × ·32	5 × 3 × ·32	5 × 3 × ·34	5 × 3 × ·34	5 × 3 × ·36	5 × 3 × ·36	5 × 3 × ·38
		Reversed frames ..	3 × 3 × ·32	3 × 3 × ·32	3 × 3 × ·34	3½ × 3 × ·34	3½ × 3 × ·36	4 × 3 × ·36	4 × 3 × ·38
		Depth of framing ..	5	5	5	5½	5½	6	6
66 and under 69	24	Frames	5 × 3 × ·34	5 × 3 × ·34	5 × 3 × ·34	5 × 3 × ·36	5 × 3 × ·36	5 × 3½ × ·38	5 × 3½ × ·38
		Reversed frames ..	3 × 3 × ·34	3 × 3 × ·34	3½ × 3 × ·34	3½ × 3 × ·36	4 × 3 × ·36	4 × 3½ × ·38	4½ × 3½ × ·38
		Depth of framing ..	5	5	5½	5½	6	6	6½
69 and under 72	24½	Frames	5½ × 3½ × ·34	5½ × 3½ × ·36	5½ × 3½ × ·36	5½ × 3½ × ·36	5½ × 3½ × ·38	5½ × 3½ × ·38	5½ × 3½ × ·40
		Reversed frames ..	3 × 3 × ·34	3 × 3½ × ·36	3 × 3½ × ·36	3½ × 3½ × ·36	3½ × 3½ × ·38	4 × 3½ × ·38	4 × 3½ × ·40
		Depth of framing ..	5½	* 5½	* 5½	6	6	6½	6½
72 and under 75	24½	Frames	5½ × 3½ × ·34		5½ × 3½ × ·36	5½ × 3½ × ·38	5½ × 3½ × ·38	5½ × 3½ × ·40	5½ × 3½ × ·40
		Reversed frames ..	3 × 3½ × ·34		3½ × 3½ × ·36	3½ × 3½ × ·38	4 × 3½ × ·38	4 × 3½ × ·40	4½ × 3½ × ·40
		Depth of framing ..	5½ *		6	6	6½	6½	7
75 and under 78	25	Frames	5½ × 3½ × ·36		5½ × 3½ × ·38	5½ × 3½ × ·38	5½ × 3½ × ·40	5½ × 3½ × ·40	5½ × 3½ × ·42
		Reversed frames ..	3 × 3½ × ·36		3½ × 3½ × ·38	4 × 3½ × ·38	4 × 3½ × ·40	4½ × 3½ × ·40	4½ × 3½ × ·42
		Depth of framing ..	5½ *		6	6½	6½	7	7
78 and under 81	25½	Frames	6 × 3½ × ·36		6 × 3½ × ·38	6 × 3½ × ·40	6 × 3½ × ·40	6 × 3½ × ·42	6 × 3½ × ·42
		Reversed frames ..	3 × 3½ × ·36		3½ × 3½ × ·38	3½ × 3½ × ·40	4 × 3½ × ·40	4 × 3½ × ·42	4½ × 3½ × ·42
		Depth of framing ..	6 *		6½	6½	7	7	7½
81 and under 84	26	Frames	6 × 3½ × ·38		6 × 3½ × ·40	6 × 3½ × ·40	6 × 3½ × ·42	6 × 3½ × ·42	6 × 3½ × ·44
		Reversed frames ..	3 × 3½ × ·38		3½ × 3½ × ·40	4 × 3½ × ·40	4 × 3½ × ·42	4½ × 3½ × ·42	4½ × 3½ × ·44
		Depth of framing ..	6 *		6½	7	7	7½	7½
84 and under 87	26½	Frames	6½ × 3½ × ·38		6½ × 3½ × ·40	6½ × 3½ × ·42	6½ × 3½ × ·42	6½ × 3½ × ·44	6½ × 3½ × ·44
		Reversed frames ..	3 × 3½ × ·38		3½ × 3½ × ·40	3½ × 3½ × ·42	4 × 3½ × ·42	4 × 3½ × ·44	4½ × 3½ × ·44
		Depth of framing ..	6½ *		7	7	7½	7½	8
87 and under 90	27	Frames	6½ × 3½ × ·40		6½ × 3½ × ·42	6½ × 3½ × ·42	6½ × 3½ × ·44	6½ × 3½ × ·44	6½ × 3½ × ·46
		Reversed frames ..	3 × 3½ × ·40		3½ × 3½ × ·42	4 × 3½ × ·42	4 × 3½ × ·44	4½ × 3½ × ·44	4½ × 3½ × ·46
		Depth of framing ..	6½ *		7	7½	7½	8	8
90 and under 93	27½	Frames	7 × 3½ × ·40		7 × 3½ × ·44	7 × 3½ × ·44	7 × 3½ × ·46	7 × 3½ × ·46	7 × 3½ × ·48
		Reversed frames ..	3 × 3½ × ·40		3½ × 3½ × ·44	4 × 3½ × ·44	4 × 3½ × ·46	4½ × 3½ × ·46	5 × 3½ × ·48
		Depth of framing ..	7 *		7½	8	8	8½	8½
93 and under 96	28	Frames	7 × 3½ × ·42		7 × 3½ × ·46	7 × 3½ × ·46	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48
		Reversed frames ..	3 × 3½ × ·42		4 × 3½ × ·46	4½ × 3½ × ·46	5 × 3½ × ·48	5½ × 3½ × ·48	5½ × 3½ × ·48
		Depth of framing ..	7 *		8	8½	8½	9	9
96 and under 99	28½	Frames	7 × 3½ × ·42		7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48
		Reversed frames ..	3½ × 3½ × ·42		5 × 3½ × ·48	5½ × 3½ × ·48	6 × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·48
		Depth of framing ..	7½		8½	9	9½	9½	10
99 and under 102	29	Frames	7 × 3½ × ·44	* The broad flange of the reversed frame is to be fitted in a fore and aft direction.		7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	6½ × 3½ × ·48
		Reversed frames ..	3½ × 3½ × ·44			6½ × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·48
		Depth of framing ..	7½			10	10½	10½	11
102 and under 105	29½	Frames	7 × 3½ × ·44			6½ × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·50
		Reversed frames ..	4 × 3½ × ·44			8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·50
		Depth of framing ..	8			11	11	11	11½

† The spacing of the frames in the peaks is not to exceed 24 inches where wider spacing is allowed amidships; and from the collision bulkhead to one-fifth the vessel's length from stem the spacing is not to exceed 27 inches unless the frames are doubled to the height of the lowest tier of beams.

FRAMES with SINGLE REVERSED FRAMES.

TABLE 2.
(See Continuation.)

TRANSVERSE NUMBER. B + D	FRAME SPACING.†		DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS AT SIDE. *See* SKETCH ON PAGE 21.						
			Feet. 13 and under 14	Feet. 14 and under 15	Feet. 15 and under 16	Feet. 16 and under 17	Feet. 17 and under 18	Feet. 18 and under 19	Feet. 19 and under 20
			ONE SIDE STRINGER.	←——TWO SIDE STRINGERS.——→					
Feet.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.
60 and under 63	23½	Frames	4½ × 3 × ·38	4½ × 3 × ·38	4½ × 3 × ·40	5 × 3 × ·40	5 × 3 × ·42	5 × 3 × ·42	5 × 3 × ·44
		Reversed frames ..	4½ × 3 × ·38	5 × 3 × ·38	5 × 3 × ·40	5 × 3 × ·40	5 × 3 × ·42	5½ × 3 × ·42	5½ × 3 × ·44
		Depth of framing ..	6	6½	6½	7	7	7½	7½
63 and under 66	24	Frames	5 × 3 × ·38	5 × 3 × ·40	5 × 3 × ·40	5 × 3 × ·42	5 × 3½ × ·42	5 × 3½ × ·42	5 × 3½ × ·44
		Reversed frames ..	4½ × 3 × ·38	4½ × 3 × ·40	5 × 3 × ·40	5 × 3 × ·42	5½ × 3½ × ·42	5½ × 3½ × ·42	5½ × 3½ × ·44
		Depth of framing ..	6½	6½	7	7	7½	7½	7½
66 and under 69	24	Frames	5 × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·42	5 × 3½ × ·42	5 × 3½ × ·44	5 × 3½ × ·44	5½ × 3½ × ·44
		Reversed frames ..	4½ × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·42	5½ × 3½ × ·42	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·44
		Depth of framing ..	6½	7	7	7½	7½	7½	8
69 and under 72	24½	Frames	5½ × 3½ × ·40	5½ × 3½ × ·42	5½ × 3½ × ·42	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·46
		Reversed frames ..	4½ × 3½ × ·40	4½ × 3½ × ·42	5 × 3½ × ·42	5 × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·46
		Depth of framing ..	7	7	7½	7½	8	8	8
72 and under 75	24½	Frames	5½ × 3½ × ·42	5½ × 3½ × ·42	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·46	5½ × 3½ × ·46
		Reversed frames ..	4½ × 3½ × ·42	5 × 3½ × ·42	5 × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·46	6 × 3½ × ·46
		Depth of framing ..	7	7½	7½	8	8	8	8½
75 and under 78	25	Frames	5½ × 3½ × ·42	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·46	5½ × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·48
		Reversed frames ..	5 × 3½ × ·42	5 × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·48
		Depth of framing ..	7½	7½	8	8	8	8½	8½
78 and under 81	25½	Frames	6 × 3½ × ·44	6 × 3½ × ·44	6 × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·48	6 × 3½ × ·48
		Reversed frames ..	4½ × 3½ × ·44	5 × 3½ × ·44	5 × 3½ × ·46	5½ × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48
		Depth of framing ..	7½	8	8	8½	8½	8½	9
81 and under 84	26	Frames	6 × 3½ × ·44	6 × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·48	6 × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·48
		Reversed frames ..	5 × 3½ × ·44	5 × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48
		Depth of framing ..	8	8	8½	8½	8½	9	9½
84 and under 87	26½	Frames	6½ × 3½ × ·46	6½ × 3½ × ·46	6½ × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48
		Reversed frames ..	4½ × 3½ × ·46	5 × 3½ × ·46	5½ × 3½ × ·48	6 × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48
		Depth of framing ..	8	8½	8½	9	9	9½	10
87 and under 90	27	Frames	6½ × 3½ × ·46	6½ × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48
		Reversed frames ..	5 × 3½ × ·46	5½ × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48
		Depth of framing ..	8½	8½	9	9½	9½	10	10½
90 and under 93	27½	Frames	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·50
		Reversed frames ..	5 × 3½ × ·48	5½ × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50
		Depth of framing ..	8½	9	9½	10	10½	11	11
93 and under 96	28	Frames	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·50	7 × 3½ × ·52
		Reversed frames ..	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·52
		Depth of framing ..	9½	10	10½	11	11	11½	11½
96 and under 99	28½	Frames	7 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·50	7 × 3½ × ·52	7 × 3½ × ·52	8 × 3½ × ·52
		Reversed frames ..	7 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·52	8 × 4 × ·52	8 × 3½ × ·52
		Depth of framing ..	10½	11	11	11½	11½	11½	12½
99 and under 102	29	Frames	6½ × 3½ × ·52	7 × 3½ × ·50	7 × 3½ × ·52	7 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54
		Reversed frames ..	8 × 3½ × ·52	8 × 3½ × ·50	8 × 3½ × ·52	8 × 4 × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 4 × ·54
		Depth of framing ..	11	11½	11½	11½	12½	12½	12½
102 and under 105	29½	Frames	7 × 3½ × ·52	7 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54		
		Reversed frames ..	8 × 3½ × ·52	8 × 4 × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 4 × ·54		
		Depth of framing ..	11½	11½	12½	12½	12½		

† The spacing of the frames in the peaks is not to exceed 24 inches where wider spacing is allowed amidships; and from the collision bulkhead to one-fifth the vessel's length from stem the spacing is not to exceed 27 inches unless the frames are doubled to the height of the lowest tier of beams.

TABLE 2.
(Concluded.)

FRAMES with SINGLE REVERSED FRAMES.

TRANSVERSE NUMBER. B + D	FRAME SPACING.†		DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS AT SIDE. *See* SKETCH ON PAGE 21.						
			Feet. 20 and under 21	Feet. 21 and under 22	Feet. 22 and under 23	Feet. 23 and under 24	Feet. 24 and under 25	Feet. 25 and under 26	Feet 26 and under 27
			TWO SIDE STRINGERS.	←——— THREE SIDE STRINGERS. ———→					
Feet.	inches.		inches.	inches.	inches.	inches.	inches.	inches.	inches.
60 and under 63	23½	Frames	5½ × 3 × ·44	5½ × 3 × ·46	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	
		Reversed frames ..	5½ × 3 × ·44	5½ × 3 × ·46	6 × 3½ × ·46	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·48	
		Depth of framing ..	8	8	8½	9	10	11	
63 and under 66	24	Frames	5½ × 3½ × ·44	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·52
		Reversed frames ..	5½ × 3½ × ·44	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·52
		Depth of framing ..	8	8	8½	9½	10½	11	11½
66 and under 69	24	Frames	5½ × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·50	7 × 3½ × ·52
		Reversed frames ..	5½ × 3½ × ·46	6 × 3½ × ·46	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 4 × ·52
		Depth of framing ..	8	8½	9	10	11	11½	11½
69 and under 72	24½	Frames	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·52	8 × 3½ × ·52
		Reversed frames ..	6 × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52
		Depth of framing ..	8½	8½	9½	10½	11	11½	12½
72 and under 75	24½	Frames	6 × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·50	7 × 3½ × ·52	8 × 3½ × ·54
		Reversed frames ..	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 4 × ·52	8 × 3½ × ·54
		Depth of framing ..	8½	9	10	11	11½	11½	12½
75 and under 78	25	Frames	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54
		Reversed frames ..	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8 × 4 × ·54
		Depth of framing ..	9	9½	10½	11	11½	12½	12½
78 and under 81	25½	Frames	6½ × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·50	7 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·56
		Reversed frames ..	6½ × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 4 × ·52	8 × 3½ × ·54	8 × 4 × ·56
		Depth of framing ..	9½	10	11	11½	11½	12½	12½
81 and under 84	26	Frames	6½ × 3½ × ·48	7 × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54
		Reversed frames ..	7 × 3½ × ·48	7 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8 × 4 × ·54	9 × 4 × ·54
		Depth of framing ..	10	10½	11	11½	12½	12½	13½
84 and under 87	26½	Frames	7 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·50	7 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·56	8 × 3½ × ·56
		Reversed frames ..	7 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 4 × ·52	8 × 3½ × ·54	8 × 4 × ·56	9 × 4 × ·56
		Depth of framing ..	10½	11	11½	11½	12½	12½	13½
87 and under 90	27	Frames	6½ × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54	8 × 3½ × ·54
		Reversed frames ..	8 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8 × 4 × ·54	9 × 4 × ·54	10 × 4 × ·54
		Depth of framing ..	11	11	11½	12½	12½	13½	14½
90 and under 93	27½	Frames	7 × 3½ × ·50	7 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54	8 × 3½ × ·54	8 × 3½ × ·58
		Reversed frames ..	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8 × 4 × ·54	9 × 4 × ·54	10 × 4 × ·54	10 × 4 × ·58
		Depth of framing ..	11½	11½	12½	12½	13½	14½	14½
93 and under 96	28	Frames	7 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54	8 × 3½ × ·54		
		Reversed frames ..	8 × 4 × ·52	8 × 3½ × ·52	8 × 4 × ·54	9 × 4 × ·54	10 × 4 × ·54		
		Depth of framing ..	11½	12½	12½	13½	14½		
96 and under 99	28½	Frames	8 × 3½ × ·54	8 × 3½ × ·54	8 × 3½ × ·54				
		Reversed frames ..	8 × 3½ × ·54	8 × 4 × ·54	9 × 4 × ·54				
		Depth of framing ..	12½	12½	13½				
99 and under 102	29	Frames							
		Reversed frames ..							
		Depth of framing ..							
102 and under 105	29½	Frames							
		Reversed frames ..							
		Depth of framing ..							

† The spacing of the frames in the peaks is not to exceed 24 inches where wider spacing is allowed amidships; and from the collision bulkhead to one-fifth the vessel's length from stem the spacing is not to exceed 27 inches unless the frames are doubled to the height of the lowest tier of beams.

FRAMES formed of SINGLE ANGLES or BULB ANGLES.

TABLE 3.

(See Continuation.)

TRANSVERSE NUMBER B + D	Spacing of Frames. *		FRAMES IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS, AT SIDE. See SKETCH ON PAGE 21.				
				Feet. 7 and under 8	Feet. 8 and under 9	Feet. 9 and under 10	Feet. 10 and under 11	Feet. 11 and under 12
				ONE SIDE STRINGER.				
Feet.	inches.		inches.	inches.	inches.	inches.	inches.	inches.
23 and under 25	20	ANGLES.	$3\frac{1}{2} \times 2\frac{1}{2} \times {\cdot}24$	$3\frac{1}{2} \times 2\frac{1}{2} \times {\cdot}24$	$3\frac{1}{2} \times 2\frac{1}{2} \times {\cdot}26$	$4 \times 2\frac{1}{2} \times {\cdot}26$	$4 \times 2\frac{1}{2} \times {\cdot}28$	
25 and under 27	20		$3\frac{1}{2} \times 2\frac{1}{2} \times {\cdot}26$	$3\frac{1}{2} \times 2\frac{1}{2} \times {\cdot}26$	$4 \times 2\frac{1}{2} \times {\cdot}26$	$4 \times 2\frac{1}{2} \times {\cdot}28$	$4 \times 2\frac{1}{2} \times {\cdot}30$	$4 \times 2\frac{1}{2} \times {\cdot}32$
27 and under 29	$20\frac{1}{2}$		$4 \times 2\frac{1}{2} \times {\cdot}26$	$4 \times 2\frac{1}{2} \times {\cdot}26$	$4 \times 2\frac{1}{2} \times {\cdot}28$	$4 \times 2\frac{1}{2} \times {\cdot}30$	$4 \times 2\frac{1}{2} \times {\cdot}32$	$4 \times 2\frac{1}{2} \times {\cdot}34$
29 and under 31	$20\frac{1}{2}$		$4 \times 2\frac{1}{2} \times {\cdot}28$	$4 \times 2\frac{1}{2} \times {\cdot}28$	$4 \times 2\frac{1}{2} \times {\cdot}30$	$4 \times 2\frac{1}{2} \times {\cdot}32$	$4 \times 2\frac{1}{2} \times {\cdot}34$	$4 \times 3 \times {\cdot}34$
31 and under 33	21		$4 \times 2\frac{1}{2} \times {\cdot}30$	$4 \times 2\frac{1}{2} \times {\cdot}30$	$4 \times 2\frac{1}{2} \times {\cdot}32$	$4 \times 2\frac{1}{2} \times {\cdot}34$	$4 \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}34$
33 and under 35	21		$4 \times 2\frac{1}{2} \times {\cdot}32$	$4 \times 2\frac{1}{2} \times {\cdot}32$	$4 \times 2\frac{1}{2} \times {\cdot}34$	$4 \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}36$
35 and under 37	$21\frac{1}{2}$		$4 \times 2\frac{1}{2} \times {\cdot}34$	$4 \times 2\frac{1}{2} \times {\cdot}34$	$4 \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}36$
37 and under 39	$21\frac{1}{2}$		$4 \times 3 \times {\cdot}34$	$4 \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}38$
39 and under 42	22		$4\frac{1}{2} \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}34$	$4\frac{1}{2} \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}38$
42 and under 45	22		$4\frac{1}{2} \times 3 \times {\cdot}36$	$4\frac{1}{2} \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}40$
45 and under 48	$22\frac{1}{2}$		$5 \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}36$	$5 \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}40$	$5\frac{1}{2} \times 3 \times {\cdot}36$
48 and under 51	$22\frac{1}{2}$		$5 \times 3 \times {\cdot}38$	$5 \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}40$	$5\frac{1}{2} \times 3 \times {\cdot}36$	$5\frac{1}{2} \times 3 \times {\cdot}38$
51 and under 54	23		$5\frac{1}{2} \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}40$	$5\frac{1}{2} \times 3 \times {\cdot}36$	$5\frac{1}{2} \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}38$
54 and under 57	23		$5\frac{1}{2} \times 3 \times {\cdot}40$	$5\frac{1}{2} \times 3 \times {\cdot}40$	$5\frac{1}{2} \times 3 \times {\cdot}36$	$5\frac{1}{2} \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}40$
57 and under 60	$23\frac{1}{2}$	BULB ANGLES.	$5\frac{1}{2} \times 3 \times {\cdot}36$	$5\frac{1}{2} \times 3 \times {\cdot}36$	$5\frac{1}{2} \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}40$	$6\frac{1}{2} \times 3 \times {\cdot}40$
60 and under 63	$23\frac{1}{2}$		$5\frac{1}{2} \times 3 \times {\cdot}38$	$5\frac{1}{2} \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}40$	$6\frac{1}{2} \times 3 \times {\cdot}40$	$6\frac{1}{2} \times 3 \times {\cdot}42$
63 and under 66	24		$6 \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}38$	$6 \times 3 \times {\cdot}40$	$6\frac{1}{2} \times 3 \times {\cdot}40$	$6\frac{1}{2} \times 3 \times {\cdot}42$	$7 \times 3 \times {\cdot}42$
66 and under 69	24		$6 \times 3 \times {\cdot}40$	$6 \times 3 \times {\cdot}40$	$6\frac{1}{2} \times 3 \times {\cdot}40$	$6\frac{1}{2} \times 3 \times {\cdot}42$	$7 \times 3 \times {\cdot}42$	$7 \times 3\frac{1}{2} \times {\cdot}44$
69 and under 72	$24\frac{1}{2}$		$6\frac{1}{2} \times 3\frac{1}{2} \times {\cdot}40$	$6\frac{1}{2} \times 3\frac{1}{2} \times {\cdot}42$	$6\frac{1}{2} \times 3\frac{1}{2} \times {\cdot}42$	$7 \times 3\frac{1}{2} \times {\cdot}42$	$7 \times 3\frac{1}{2} \times {\cdot}44$	$7\frac{1}{2} \times 3\frac{1}{2} \times {\cdot}44$

* The spacing of the frames in the peaks is not to exceed 24 inches where wider spacing is allowed amidships.

FRAMES formed of SINGLE ANGLES, BULB ANGLES or CHANNELS.

TABLE 3.

(See Continuation.)

TRANSVERSE NUMBER. B + D	SPACING OF FRAMES.*		DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS, AT SIDE. *See* SKETCH ON PAGE 21.				
			Feet. 12 and under 13	Feet. 13 and under 14	Feet. 14 and under 15	Feet. 15 and under 16	Feet. 16 and under 17
			ONE SIDE STRINGER.		TWO SIDE STRINGERS.		
Feet.	inches.		inches.	inches	inches.	inches.	inches.
23 and under 25	20	ANGLES.					
25 and under 27	20	ANGLES.					
27 and under 29	$20\frac{1}{2}$	ANGLES.	$4 \times 3 \times \cdot 34$				
29 and under 31	$20\frac{1}{2}$	ANGLES.	$4\frac{1}{2} \times 3 \times \cdot 34$	$4\frac{1}{2} \times 3 \times \cdot 36$			
31 and under 33	21	ANGLES.	$4\frac{1}{2} \times 3 \times \cdot 36$	$5 \times 3 \times \cdot 36$	$5 \times 3 \times \cdot 38$		
33 and under 35	21	ANGLES.	$5 \times 3 \times \cdot 36$	$5 \times 3 \times \cdot 38$	$5\frac{1}{2} \times 3 \times \cdot 38$	$5\frac{1}{2} \times 3 \times \cdot 40$	
35 and under 37	$21\frac{1}{2}$	ANGLES.	$5 \times 3 \times \cdot 38$	$5\frac{1}{2} \times 3 \times \cdot 38$	$5\frac{1}{2} \times 3 \times \cdot 40$	$5\frac{1}{2} \times 3 \times \cdot 36$	$5\frac{1}{2} \times 3 \times \cdot 38$
37 and under 39	$21\frac{1}{2}$	ANGLES.	$5\frac{1}{2} \times 3 \times \cdot 38$	$5\frac{1}{2} \times 3 \times \cdot 40$	$5\frac{1}{2} \times 3 \times \cdot 36$	$5\frac{1}{2} \times 3 \times \cdot 38$	$6 \times 3 \times \cdot 38$
39 and under 42	22	ANGLES.	$5\frac{1}{2} \times 3 \times \cdot 40$	$5\frac{1}{2} \times 3 \times \cdot 36$	$5\frac{1}{2} \times 3 \times \cdot 38$	$6 \times 3 \times \cdot 38$	$6 \times 3 \times \cdot 40$
42 and under 45	22	BULB ANGLES.	$5\frac{1}{2} \times 3 \times \cdot 36$	$5\frac{1}{2} \times 3 \times \cdot 38$	$6 \times 3 \times \cdot 38$	$6 \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3 \times \cdot 40$
45 and under 48	$22\frac{1}{2}$	BULB ANGLES.	$5\frac{1}{2} \times 3 \times \cdot 38$	$6 \times 3 \times \cdot 38$	$6 \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3 \times \cdot 42$
48 and under 51	$22\frac{1}{2}$	BULB ANGLES.	$6 \times 3 \times \cdot 38$	$6 \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3 \times \cdot 42$	$7 \times 3 \times \cdot 42$
51 and under 54	23	BULB ANGLES.	$6 \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3 \times \cdot 42$	$7 \times 3 \times \cdot 42$	$7 \times 3 \times \cdot 44$
54 and under 57	23	BULB ANGLES.	$6\frac{1}{2} \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3 \times \cdot 42$	$7 \times 3 \times \cdot 42$	$7 \times 3 \times \cdot 44$	$7\frac{1}{2} \times 3 \times \cdot 44$
57 and under 60	$23\frac{1}{2}$	BULB ANGLES.	$6\frac{1}{2} \times 3 \times \cdot 42$	$7 \times 3 \times \cdot 42$	$7 \times 3 \times \cdot 44$	$7\frac{1}{2} \times 3 \times \cdot 44$	$7\frac{1}{2} \times 3 \times \cdot 46$
60 and under 63	$23\frac{1}{2}$	BULB ANGLES.	$7 \times 3 \times \cdot 42$	$7 \times 3 \times \cdot 44$	$7\frac{1}{2} \times 3 \times \cdot 44$	$7\frac{1}{2} \times 3 \times \cdot 46$	$8 \times 3 \times \cdot 46$
63 and under 66	24	BULB ANGLES.	$7 \times 3 \times \cdot 44$	$7\frac{1}{2} \times 3 \times \cdot 44$	$7\frac{1}{2} \times 3 \times \cdot 46$	$8 \times 3 \times \cdot 46$	$8 \times 3 \times \cdot 48$
66 and under 69	24	BULB ANGLES.	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$8 \times 3\frac{1}{2} \times \cdot 46$	$8 \times 3\frac{1}{2} \times \cdot 48$	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$ $8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$
69 and under 72	$24\frac{1}{2}$	BULB ANGLES.	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$8 \times 3\frac{1}{2} \times \cdot 46$	$8 \times 3\frac{1}{2} \times \cdot 48$	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$ $8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$ $8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$

* The spacing of the frames in the peaks is not to exceed 24 inches where wider spacing is allowed amidships.

FRAMES formed of BULB ANGLES or CHANNELS.

TABLE 3.

(See Continuation.)

TRANSVERSE NUMBER. B + D	SPACING OF FRAMES.*		DEPTH (d) AT MIDDLE OF LENGTH, FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS, AT SIDE. *See* SKETCH ON PAGE 21.				
			Feet. 17 and under 18	Feet. 18 and under 19	Feet. 19 and under 20	Feet. 20 and under 21	Feet. 21 and under 22
			<— TWO SIDE STRINGERS			—>	THREE SIDE STRINGERS.
Feet.	inches.		inches.	inches.	inches.	inches.	inches.
23 and under 25	20						
25 and under 27	20						
27 and under 29	20½						
29 and under 31	20½						
31 and under 33	21						
33 and under 35	21						
35 and under 37	21½						
37 and under 39	21½	BULB ANGLES.	6 × 3 × ·40				
39 and under 42	22		6½ × 3 × ·40	6½ × 3 × ·42			
42 and under 45	22		6½ × 3 × ·42	7 × 3 × ·42	7 × 3 × ·44		
45 and under 48	22½		7 × 3 × ·42	7 × 3 × ·44	7½ × 3 × ·44	7½ × 3 × ·46	
48 and under 51	22½		7 × 3 × ·44	7½ × 3 × ·44	7½ × 3 × ·46	8 × 3 × ·46	8 × 3 × ·48
51 and under 54	23		7½ × 3 × ·44	7½ × 3 × ·46	8 × 3 × ·46	8 × 3 × ·48	8½ × 3 × ·48
54 and under 57	23		7½ × 3 × ·46	8 × 3 × ·46	8 × 3 × ·48	8½ × 3 × ·48	8½ × 3 × ·50
57 and under 60	23½		8 × 3 × ·46	8 × 3 × ·48	8½ × 3 × ·48	8½ × 3 × ·50	9 × 3 × ·50
60 and under 63	23½		8 × 3 × ·48	8½ × 3 × ·48	8½ × 3 × ·50	9 × 3 × ·50	9 × 3 × ·52
63 and under 66	24	CHANNELS OR BULB ANGLES.	7½ × 3½ × 3½ × ·42 8½ × 3½ × ·48	7½ × 3½ × 3½ × ·42 8½ × 3½ × ·48	7½ × 3½ × 3½ × ·44 8½ × 3½ × ·50	8 × 3½ × 3½ × ·44 9 × 3½ × ·50	8 × 3½ × 3½ × ·46 9 × 3½ × ·52
66 and under 69	24		7½ × 3½ × 3½ × ·44 8½ × 3½ × ·50	7½ × 3½ × 3½ × ·44 8½ × 3½ × ·50	8 × 3½ × 3½ × ·44 9 × 3½ × ·50	8 × 3½ × 3½ × ·46 9 × 3½ × ·52	8½ × 3½ × 3½ × ·46 9½ × 3½ × ·52
69 and under 72	24½		8 × 3½ × 3½ × ·44 9 × 3½ × ·50	8 × 3½ × 3½ × ·44 9 × 3½ × ·50	8 × 3½ × 3½ × ·46 9 × 3½ × ·52	8½ × 3½ × 3½ × ·46 9½ × 3½ × ·52	8½ × 3½ × 3½ × ·48 9½ × 3½ × ·54

* The spacing of the frames in the peaks is not to exceed 24 inches where wider spacing is allowed amidships.

FRAMES formed of BULB ANGLES or CHANNELS.

TABLE 3.

(See Continuation.)

TRANSVERSE NUMBER. B + D	SPACING OF FRAMES.*		DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS, AT SIDE. *See* SKETCH ON PAGE 21. Feet. 22 and under 23	Feet. 23 and under 24	Feet. 24 and under 25	Feet. 25 and under 26	Feet. 26 and under 27
			THREE SIDE STRINGERS.				
Feet.	inches.		inches.	inches.	inches.	inches.	inches.
23 and under 25	20						
25 and under 27	20						
27 and under 29	$20\frac{1}{2}$						
29 and under 31	$20\frac{1}{2}$						
31 and under 33	21						
33 and under 35	21						
35 and under 37	$21\frac{1}{2}$						
37 and under 39	$21\frac{1}{2}$						
39 and under 42	22						
42 and under 45	22						
45 and under 48	$22\frac{1}{2}$						
48 and under 51	$22\frac{1}{2}$						
51 and under 54	23	BULB ANGLES.	$9 \times 3 \times \cdot 50$				
54 and under 57	23	BULB ANGLES.	$9 \times 3 \times \cdot 52$	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ $9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$			
57 and under 60	$23\frac{1}{2}$	CHANNELS OR BULB ANGLES.	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ $9 \times 3\frac{1}{2} \times \cdot 52$	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10 \times 3\frac{1}{2} \times \cdot 56$		
60 and under 63	$23\frac{1}{2}$	CHANNELS OR BULB ANGLES.	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ $9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10 \times 3\frac{1}{2} \times \cdot 54$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $11 \times 3\frac{1}{2} \times \cdot 58$	
63 and under 66	24	CHANNELS OR BULB ANGLES.	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10 \times 3\frac{1}{2} \times \cdot 56$	$10\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ $11 \times 3\frac{1}{2} \times \cdot 60$	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ $11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 62$
66 and under 69	24	CHANNELS OR BULB ANGLES.	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10 \times 3\frac{1}{2} \times \cdot 54$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $11 \times 3\frac{1}{2} \times \cdot 58$	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ $11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ $12 \times 3\frac{1}{2} \times \cdot 62$
69 and under 72	$24\frac{1}{2}$	CHANNELS OR BULB ANGLES.	$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10 \times 3\frac{1}{2} \times \cdot 56$	$10\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ $10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ $11 \times 3\frac{1}{2} \times \cdot 60$	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ $11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 62$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ $12 \times 3\frac{1}{2} \times \cdot 66$

* The spacing of the frames in the peaks is not to exceed 24 inches where wider spacing is allowed amidships.

FRAMES formed of BULB ANGLES, CHANNELS, or CHANNELS WITH REVERSED FRAMES.

TABLE 3.

(See Continuation.)

TRANSVERSE NUMBER. B + D	Spacing of Frames. *	FRAMES IN PEAKS.		DEPTH (d) AT MIDDLE OF LENGTH, FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF LOWEST TIER OF BEAMS, AT SIDE. See SKETCH ON PAGE 21.			
				Feet. 8 and under 9	Feet. 9 and under 10	Feet. 10 and under 11	Feet. 11 and under 12
				ONE SIDE STRINGER.			
Feet.	inches.	inches. BULB ANGLES.		inches.	inches.	inches.	inches.
72 and under 75	24½	6½ × 3½ × ·40	BULB ANGLES.	7 × 3½ × ·42	7 × 3½ × ·44	7½ × 3½ × ·44	7½ × 3½ × ·46
75 and under 78	25	6½ × 3½ × ·42		7 × 3½ × ·44	7½ × 3½ × ·44	7½ × 3½ × ·46	8 × 3½ × ·46
78 and under 81	25½	7 × 3½ × ·42		7½ × 3½ × ·44	7½ × 3½ × ·46	8 × 3½ × ·46	8 × 3½ × ·48
81 and under 84	26	7 × 3½ × ·44		7½ × 3½ × ·46	8 × 3½ × ·46	8 × 3½ × ·48	7½ × 3½ × 3½ × ·42 8½ × 3½ × ·48
84 and under 87	26½	7½ × 3½ × ·44		8 × 3½ × ·46	8 × 3½ × ·48	7½ × 3½ × 3½ × ·42 8½ × 3½ × ·48	7½ × 3½ × 3½ × ·44 8½ × 3½ × ·50
87 and under 90	27	7½ × 3½ × ·46		8 × 3½ × ·48	7½ × 3½ × 3½ × ·42 8½ × 3½ × ·48	7½ × 3½ × 3½ × ·44 8½ × 3½ × ·50	8 × 3½ × 3½ × ·44 9 × 3½ × ·50
90 and under 93	27½	8 × 3½ × ·46	CHANNELS OR BULB ANGLES.	7½ × 3½ × 3½ × ·44 8½ × 3½ × ·50	8 × 3½ × 3½ × ·44 9 × 3½ × ·50	8 × 3½ × 3½ × ·46 9 × 3½ × ·52	8½ × 3½ × 3½ × ·46 9½ × 3½ × ·52
93 and under 96	28	8 × 3½ × ·48		8 × 3½ × 3½ × ·46 9 × 3½ × ·52	8½ × 3½ × 3½ × ·46 9½ × 3½ × ·52	8½ × 3½ × 3½ × ·48 9½ × 3½ × ·54	9 × 3½ × 3½ × ·48 10 × 3½ × ·54
96 and under 99	28½	8½ × 3½ × ·48		8½ × 3½ × 3½ × ·48 9½ × 3½ × ·54	9 × 3½ × 3½ × ·48 10 × 3½ × ·54	9½ × 3½ × 3½ × ·48 10 × 3½ × ·56	9½ × 3½ × 3½ × ·48 10 × 3½ × ·56
99 and under 102	29	8½ × 3½ × ·50			10 × 3½ × 3½ × ·48 10½ × 3½ × ·56	10½ × 3½ × 3½ × ·48 10½ × 3½ × ·58	10½ × 3½ × 3½ × ·48 10½ × 3½ × ·58
102 and under 105	29½	9 × 3½ × ·50			11 × 3½ × 3½ × ·48 11 × 3½ × ·58	11 × 3½ × 3½ × ·48 11 × 3½ × ·58	11 × 3½ × 3½ × ·50 11 × 3½ × ·60
105 and under 108	30	9 × 3½ × ·52	CHANNELS WITH REVERSED FRAMES EXTENDING TO THE LOWER EDGE OF THE BEAMS OF THE LOWEST DECK.		8 × 3½ × 3½ × ·46 3½ × 3½ × ·46	8 × 3½ × 3½ × ·46 3½ × 3½ × ·46	8½ × 3½ × 3½ × ·46 3½ × 3½ × ·46
108 and under 111	30½	9½ × 3½ × ·52			9 × 3½ × 3½ × ·46 3½ × 3½ × ·46	9 × 3½ × 3½ × ·46 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·46 3½ × 3½ × ·46
111 and under 114	31	9½ × 3½ × ·54			9½ × 3½ × 3½ × ·48 3½ × 3½ × ·48	9½ × 3½ × 3½ × ·48 3½ × 3½ × ·48	10 × 3½ × 3½ × ·48 3½ × 3½ × ·48
114 and under 118	31½	10 × 3½ × ·54			9 × 4 × 4 × ·52 4 × 3½ × ·52	9 × 4 × 4 × ·52 4 × 3½ × ·52	10 × 4 × 4 × ·50 4 × 3½ × ·50
118 and under 122	32	10 × 3½ × ·56			10 × 4 × 4 × ·52 4 × 3½ × ·52	10 × 4 × 4 × ·52 4 × 3½ × ·52	11 × 3½ × 3½ × ·50 4 × 3½ × ·50
122 and under 126	32½	10½ × 3½ × ·56			11 × 4 × 4 × ·52 4 × 3½ × ·52	11 × 4 × 4 × ·52 4 × 3½ × ·52	11 × 4 × 4 × ·54 4 × 4 × ·54
126 and under 130	33	10½ × 3½ × ·58			11 × 4 × 4 × ·54 4 × 4 × ·54	11 × 4 × 4 × ·54 4 × 4 × ·54	12 × 4 × 4 × ·54 4 × 4 × ·54

* The spacing of the frames in the peaks is not to exceed 24 inches where wider spacing is allowed amidships; and from the collision bulkhead to one-fifth the vessel's length from the stem the spacing is not to exceed 27 inches unless the frames are doubled to the height of the lowest tier of beams.

FLOOR PLATES IN VESSELS WITH SINGLE BOTTOMS. TABLE 4.

Transverse Number. B + D	Depth at Centre.	Thickness* For 3/5 length Amidships.	Thickness* At Ends of Vessel.	Transverse Number. B + D	Depth at Centre.	Thickness* For 3/5 length Amidships.	Thickness* At Ends of Vessel.
feet	inches.	inches.	inches.	feet.	inches.	inches.	inches.
23 and under 24	8½	·22	·22	48 and under 49	19	·36	·32
24 and under 25	8½	·24	·24	49 and under 50	20	·36	·32
25 and under 26	9	·24	·24	50 and under 51	20	·38	·34
26 and under 27	9½	·24	·24	51 and under 52	21	·38	·34
27 and under 28	10	·24	·24	52 and under 53	22	·38	·34
28 and under 29	10	·26	·24	53 and under 54	22	·40	·34
29 and under 30	10½	·26	·24	54 and under 55	23	·40	·34
30 and under 31	11	·26	·24	55 and under 56	24	·40	·34
31 and under 32	11½	·26	·24	56 and under 58	24	·42	·36
32 and under 33	11½	·28	·26	58 and under 60	25	·42	·36
33 and under 34	12	·28	·26	60 and under 62	26	·42	·36
34 and under 35	12½	·28	·26	62 and under 64	26	·44	·36
35 and under 36	13	·28	·26	64 and under 66	27	·44	·36
36 and under 37	13	·30	·26	66 and under 68	28	·44	·36
37 and under 38	13½	·30	·26	68 and under 70	28	·46	·38
38 and under 39	14	·30	·26	70 and under 72	29	·46	·38
39 and under 40	14½	·30	·26	72 and under 74	30	·46	·38
40 and under 41	14½	·32	·28	74 and under 76	30	·48	·38
41 and under 42	15	·32	·28	76 and under 78	31	·48	·38
42 and under 43	15½	·32	·28	78 and under 80	32	·48	·38
43 and under 44	16	·32	·28	80 and under 82	32	·50	·40
44 and under 45	16	·34	·30	82 and under 84	33	·50	·40
45 and under 46	17	·34	·30	84 and under 86	34	·50	·40
46 and under 47	18	·34	·30	86 and under 88	35	·50	·40
47 and under 48	18	·36	·32				

* In the engine space of steam vessels the floors are to be ·04 of an inch thicker, and in the boiler space ·10 of an inch thicker than required by the Table.

Lloyd's Register of British and Foreign Shipping, London—*17th June, 1909.*

WEB FRAMES and STRINGERS.

TABLE 5.

(See Continuation.)

TRANSVERSE NUMBER. B + D.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF BEAMS AT SIDE OF LOWEST LAID DECK.													THICKNESS OF STRINGER PLATES.
	feet. 14 and under 15	feet. 15 and under 16	feet 16 and under 17	feet. 17 and under 18	feet. 18 and under 19	feet. 19 and under 20	feet. 20 and under 21	feet. 21 and under 22	feet. 22 and under 23	feet. 23 and under 24	feet. 24 and under 25	feet. 25 and under 26	feet. 26 and under 27	
	ONE SIDE STRINGER.		< TWO SIDE STRINGERS. >								< THREE SIDE STRINGERS. >			
feet.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	ins.
48 and under 51	14 × ·30	14 × ·32	14 × ·34	14 × ·36	15 × ·36									·30
51 and under 54	14 × ·32	14 × ·34	14 × ·36	15 × ·36	16 × ·36	16 × ·38								·30
54 and under 57	14 × ·34	14 × ·36	15 × ·36	16 × ·36	16 × ·38	17 × ·38	18 × ·38							·30
57 and under 60	14 × ·36	15 × ·36	16 × ·36	16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·42					·30
60 and under 63	15 × ·36	16 × ·36	16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·40	21 × ·42	22 × ·44	24 × ·44			·32
63 and under 66	16 × ·36	16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·40	21 × ·40	22 × ·42	23 × ·44	24 × ·46	26 × ·46	27 × ·48	·32
66 and under 69	16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·44	24 × ·44	25 × ·46	26 × ·48	28 × ·48	·34
69 and under 72	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·42	23 × ·44	24 × ·46	26 × ·46	27 × ·48	28 × ·50	·34
72 and under 75	18 × ·38	18 × ·40	19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·42	23 × ·42	24 × ·44	25 × ·46	26 × ·48	28 × ·48	29 × ·50	·34
75 and under 78	18 × ·40	19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·42	22 × ·44	23 × ·44	24 × ·46	26 × ·46	27 × ·48	28 × ·50	30 × ·50	·36
78 and under 81	19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·42	22 × ·44	23 × ·44	24 × ·44	25 × ·46	26 × ·48	28 × ·48	29 × ·50	30 × ·52	·36
81 and under 84	20 × ·40	20 × ·42	21 × ·42	22 × ·42	22 × ·44	23 × ·44	24 × ·44	25 × ·44	26 × ·46	27 × ·48	28 × ·50	30 × ·50	31 × ·52	·38
84 and under 87	20 × ·42	21 × ·42	22 × ·42	22 × ·44	23 × ·44	24 × ·44	24 × ·46	25 × ·46	26 × ·48	28 × ·48	29 × ·50	30 × ·52	32 × ·52	·38
87 and under 90	21 × ·42	22 × ·42	22 × ·44	23 × ·44	24 × ·44	24 × ·46	25 × ·46	26 × ·46	27 × ·48	28 × ·50	30 × ·50	31 × ·52	32 × ·54	·40
90 and under 93	22 × ·44	23 × ·44	24 × ·44	24 × ·46	25 × ·46	26 × ·46	26 × ·48	27 × ·48	28 × ·50	30 × ·50	31 × ·52	32 × ·54	34 × ·54	·40
93 and under 96	24 × ·44	24 × ·46	25 × ·46	26 × ·46	26 × ·48	27 × ·48	28 × ·48	29 × ·48	30 × ·50	31 × ·52	32 × ·54	34 × ·54	35 × ·56	·42
96 and under 99	25 × ·46	26 × ·46	26 × ·48	27 × ·48	28 × ·48	28 × ·50	29 × ·50	30 × ·50	31 × ·52	32 × ·54	34 × ·54	35 × ·56	36 × ·58	·42
99 and under 102	26 × ·48	27 × ·48	28 × ·48	28 × ·50	29 × ·50	30 × ·50	30 × ·52	31 × ·52	32 × ·54	34 × ·54	35 × ·56	36 × ·58	38 × ·58	·44
102 and under 105	28 × ·48	28 × ·50	29 × ·50	30 × ·50	30 × ·52	31 × ·52	32 × ·52	33 × ·52	34 × ·54	35 × ·56	36 × ·58	38 × ·58	39 × ·60	·44
105 and under 108	29 × ·50	30 × ·50	30 × ·52	31 × ·52	32 × ·52	32 × ·54	33 × ·54	34 × ·54	35 × ·56	36 × ·58	38 × ·58	39 × ·60	40 × ·62	·46
108 and under 111	30 × ·52	31 × ·52	32 × ·52	32 × ·54	33 × ·54	34 × ·54	34 × ·56	35 × ·56	36 × ·58	38 × ·58	39 × ·60	40 × ·62	42 × ·62	·46
111 and under 114	32 × ·52	32 × ·54	33 × ·54	34 × ·54	34 × ·56	35 × ·56	36 × ·56	37 × ·56	38 × ·58	39 × ·60	40 × ·62	42 × ·62		·48
114 and under 118	33 × ·54	34 × ·54	34 × ·56	35 × ·56	36 × ·56	36 × ·58	37 × ·58	38 × ·58	39 × ·60	40 × ·62	42 × ·62			·48
118 and under 122	34 × ·56	35 × ·56	36 × ·56	36 × ·58	37 × ·58	38 × ·58	38 × ·60	39 × ·60	40 × ·62	42 × ·62				·50
122 and under 126	36 × ·56	36 × ·58	37 × ·58	38 × ·58	38 × ·60	39 × ·60	40 × ·60	41 × ·60	42 × ·62					·50
126 and under 130	37 × ·58	38 × ·58	38 × ·60	39 × ·60	39 × ·62	40 × ·62	41 × ·62	42 × ·62						·52

INTERMEDIATE FRAMES, FACE ANGLES, &c.

(Concluded.)

TRANSVERSE NUMBER. B + D.	FRAME SPACING.*	INTERMEDIATE FRAMES. Built Framing. Frames.	Reversed Frames.	Bulb Angles.	Channels.	FACE ANGLES. Double on Web Frames, Single on Stringers.	Single on Web Frames.	BUTT STRAPS FOR STRINGER FACE ANGLES. Dimensions. Length.	Breadth.	Thickness.	Rivets. Number in Straps and Stringer Face Angles	Number in Straps and Web Frame Face Angles
feet.	ins.	inches.	inches.	inches.	inches.	inches.	inches.	ins.	ins.	ins.		
48 and under 51	22½	3½ × 3 × ·30	3 × 2½ × ·30			3 × 3 × ·30	5 × 3 × ·48	42	6	·46	10	2
51 and under 54	23	3½ × 3 × ·30	3 × 3 × ·30			3 × 3 × ·32	5 × 3 × ·50	„	„	„	„	„
54 and under 57	23	4 × 3 × ·30	3 × 3 × ·30			3 × 3 × ·34	5 × 3 × ·52	„	„	·48	„	„
57 and under 60	23½	4½ × 3 × ·30	3 × 3 × ·30	5½ × 3 × ·36		3 × 3 × ·36	5 × 3½ × ·52	„	„	„	„	„
60 and under 63	23½	4½ × 3 × ·32	3 × 3 × ·32	5½ × 3 × ·38		3½ × 3 × ·36	5 × 3½ × ·54	„	„	·50	„	„
63 and under 66	24	5 × 3 × ·32	3 × 3 × ·32	6 × 3 × ·38		3½ × 3 × ·38	6 × 3½ × ·54	„	„	„	„	„
66 and under 69	24	5 × 3 × ·34	3 × 3 × ·34	6 × 3 × ·40		3½ × 3 × ·40	6 × 3½ × ·56	„	„	·52	„	„
69 and under 72	24½	5½ × 3½ × ·34	3 × 3 × ·34	6½ × 3½ × ·40		3½ × 3½ × ·40	6½ × 3½ × ·58	48	7	„	12	4
72 and under 75	24½	5½ × 3½ × ·34	3½ × 3 × ·34	6½ × 3½ × ·40		3½ × 3½ × ·42	6½ × 3½ × ·60	„	„	·54	„	„
75 and under 78	25	5½ × 3½ × ·36	3½ × 3 × ·36	6½ × 3½ × ·42		3½ × 3½ × ·44	7 × 3½ × ·60	„	„	„	„	„
78 and under 81	25½	6 × 3½ × ·36	3½ × 3 × ·36	7 × 3½ × ·42		3½ × 3½ × ·46	7 × 3½ × ·62	„	„	·56	„	„
81 and under 84	26	6 × 3½ × ·38	3½ × 3 × ·38	7 × 3½ × ·44		3½ × 3½ × ·48	7 × 3½ × ·64	„	„	„	„	„
84 and under 87	26½	6½ × 3½ × ·38	3½ × 3 × ·38	7½ × 3½ × ·44		3½ × 3½ × ·50	7 × 3½ × ·66	„	„	·58	„	„
87 and under 90	27	6½ × 3½ × ·40	3½ × 3 × ·40	7½ × 3½ × ·46		3½ × 3½ × ·52	7 × 3½ × ·68	„	„	„	„	„
90 and under 93	27½	7 × 3½ × ·40	3½ × 3 × ·40	8 × 3½ × ·46		4 × 3½ × ·52		54	8	·60	„	„
93 and under 96	28	7 × 3½ × ·42	3½ × 3 × ·42	8 × 3½ × ·48	7 × 3½ × 3½ × ·42	4 × 3½ × ·54		„	„	„	„	„
96 and under 99	28½	7 × 3½ × ·42	3½ × 3½ × ·42	8½ × 3½ × ·48	7½ × 3½ × 3½ × ·42	4 × 3½ × ·56		„	„	·62	„	„
99 and under 102	29	7 × 3½ × ·44	3½ × 3½ × ·44	8½ × 3½ × ·50	7½ × 3½ × 3½ × ·44	4 × 3½ × ·58		„	„	„	„	„
102 and under 105	29½	7 × 3½ × ·44	4 × 3½ × ·44	9 × 3½ × ·50	8 × 3½ × 3½ × ·44	4 × 4 × ·58		„	„	·64	„	„
105 and under 108	30	7 × 3½ × ·46	4 × 3½ × ·46	9 × 3½ × ·52	8 × 3½ × 3½ × ·46	4 × 4 × ·60		„	„	„	„	„
108 and under 111	30½			9½ × 3½ × ·52	8½ × 3½ × 3½ × ·46	4 × 4 × ·62		„	„	·66	„	„
111 and under 114	31			9½ × 3½ × ·54	8½ × 3½ × 3½ × ·48	4 × 4 × ·64		60	12	„	14	6
114 and under 118	31½				9 × 4 × 4 × ·48	4½ × 4½ × ·64		„	„	·68	„	„
118 and under 122	32				9 × 4 × 4 × ·52	4½ × 4½ × ·66		„	„	„	„	„
122 and under 126	32½				10 × 4 × 4 × ·52	4½ × 4½ × ·68		„	„	·70	„	„
126 and under 130	33				10 × 4 × 4 × ·56	4½ × 4½ × ·70		„	„	„	„	„

* From the collision bulkhead to one-fifth the vessel's length from stem the spacing of the frames is not to exceed 27 inches when wider spacing is allowed amidships.

MIDDLE LINE KEELSONS in VESSELS with SINGLE BOTTOMS.

TABLE 6.
(See Continuation.)

LONGITUDINAL NUMBER. L × (B + D)	KEELSON ANGLES.		MIDDLE LINE KEELSONS.								
			Ordinary Keelsons standing upon floors.⁎		Keelsons with Intercostal Plates.				Keelsons with Centre Through Plate.⁎⁎		
							Intercostal Plate.			Thickness of centre through plate and foundation plates.	
	For ½ length Amidships.	Thickness at Ends.	For ½ length Amidships.	Thickness at Ends.	For ½ length Amidships.	Thickness at Ends.	For ½ length Amidships.	Thickness at Ends.	Double Angles.	For ½ length Amidships.	At Ends.
	inches.	inches.	inches. Double Bulb Angles.	inches.	inches. Double Angles.	inches.	inches.	inches	inches.	inches.	inches.
1200 and under 1400	3 × 3 × ·24	·24	6½ × 3 × ·38	·38	3 × 3 × ·30	·30	·26	·26	3 × 3 × ·24	·26	·26
1400 and under 1700	3 × 3 × ·24	·24	7 × 3 × ·40	·40	3½ × 3 × ·30	·30	·26	·26	3 × 3 × ·24	·26	·26
1700 and under 2000	3 × 3 × ·24	·24	7½ × 3 × ·42	·42	3½ × 3 × ·32	·32	·28	·26	3 × 3 × ·24	·28	·26
2000 and under 2400	3 × 3 × ·24	·24	8 × 3 × ·44	·44	3½ × 3½ × ·32	·32	·28	·26	3 × 3 × ·24	·28	·26
2400 and under 2800	3 × 3 × ·26	·26	8 × 3½ × ·46	·46	3½ × 3½ × ·34	·34	·30	·26	3 × 3 × ·26	·30	·26
2800 and under 3200	3 × 3 × ·26	·26	8 × 3½ × ·48	·48	4 × 3½ × ·34	·34	·30	·26	3 × 3 × ·26	·30	·26
3200 and under 3700	3 × 3 × ·28	·28	8½ × 3½ × ·48	·48	4 × 3½ × ·36	·36	·30	·26	3 × 3 × ·28	·30	·26
3700 and under 4200	3 × 3 × ·28	·28	9 × 3½ × ·48	·48	4½ × 3½ × ·36	·36	·32	·28	3 × 3 × ·28	·32	·28
4200 and under 4700	3 × 3 × ·30	·30	9 × 3½ × ·50	·50	4½ × 3½ × ·38	·38	·32	·28	3 × 3 × ·30	·32	·28
			Plate, Four Angles & Rider	Plate.†	Double Bulb Angles.						
4700 and under 5200	3 × 3 × ·30	·30	11 × ·42	·34	5½ × 3 × ·36	·36	·32	·28	3 × 3 × ·30	·32	·28
5200 and under 5800	3½ × 3 × ·30	·30	11 × ·44	·38	5½ × 3 × ·38	·38	·34	·30	3½ × 3 × ·30	·34	·30
5800 and under 6400	3½ × 3 × ·32	·32	12 × ·44	·38	5½ × 3 × ·40	·40	·34	·30	3½ × 3 × ·32	·34	·30
6400 and under 7000	3½ × 3 × ·32	·32	12 × ·46	·38	6 × 3 × ·40	·40	·34	·30	3½ × 3 × ·32	·34	·30
7000 and under 7600	3½ × 3 × ·34	·34	13 × ·46	·38	6½ × 3 × ·40	·40	·36	·32	3½ × 3 × ·34	·36	·32
7600 and under 8200	4 × 3 × ·34	·34	13 × ·48	·40	7 × 3 × ·40	·40	·36	·32	4 × 3 × ·34	·36	·32
8200 and under 8800	4 × 3 × ·34	·34	14 × ·48	·40	7½ × 3 × ·42	·42	·36	·32	4 × 3 × ·34	·36	·32
8800 and under 9400	4 × 3 × ·36	·34	14 × ·50	·40	8 × 3 × ·44	·44	·38	·34	4 × 3 × ·36	·38	·34
9400 and under 10000	4 × 3 × ·36	·34	15 × ·50	·40	8 × 3½ × ·46	·46	·38	·34	4 × 3 × ·36	·38	·34
									Double Bulb Angles.		
10000 and under 10600	4½ × 3 × ·36	·34	15 × ·52	·42	8 × 3½ × ·48	·48	·38	·34	5½ × 3 × ·38	·38	·34
10600 and under 11200	4½ × 3½ × ·36	·34	16 × ·52	·42	8½ × 3½ × ·48	·48	·40	·36	5½ × 3 × ·40	·40	·36
11200 and under 11800	4½ × 3½ × ·36	·34	16 × ·54	·44	9 × 3½ × ·48	·48	·40	·36	6 × 3 × ·40	·40	·36
11800 and under 12400	5 × 3½ × ·36	·34	17 × ·54	·44	9 × 3½ × ·50	·50	·40	·36	6½ × 3 × ·40	·40	·36
					Plate, Four Angles & Rider	Plate.†					
12400 and under 13000	5 × 3½ × ·38	·36	17 × ·56	·46	10 × ·56	·46	·42	·38	7 × 3 × ·40	·42	·38
13000 and under 13600	5 × 3½ × ·40	·36	18 × ·56	·46	11 × ·56	·46	·42	·38	7½ × 3 × ·42	·42	·38
13600 and under 14200	5 × 3½ × ·40	·36	18 × ·58	·48	11 × ·58	·48	·42	·38	8 × 3 × ·44	·42	·38
14200 and under 14800	5½ × 3½ × ·40	·36	19 × ·58	·48	12 × ·58	·48	·44	·38	8 × 3½ × ·46	·44	·38
14800 and under 15400	5½ × 3½ × ·40	·36	19 × ·60	·50	12 × ·60	·50	·44	·38	8 × 3½ × ·48	·44	·38
15400 and under 16000	5½ × 3½ × ·42	·36	20 × ·60	·50	13 × ·60	·50	·44	·38	8½ × 3½ × ·48	·44	·38
16000 and under 16600	6 × 3½ × ·42	·36	20 × ·62	·52	13 × ·62	·52	·46	·40	9 × 3½ × ·48	·46	·40
16600 and under 17200	6 × 3½ × ·42	·36	21 × ·62	·52	14 × ·62	·52	·46	·40	9 × 3½ × ·50	·46	·40
									Plate, Four Angles and Rider Plate.†		
17200 and under 18000	6 × 3½ × ·44	·38	21 × ·64	·54	14 × ·64	·54	·46	·40	11	·46	·40
18000 and under 19000	6 × 3½ × ·44	·38	22 × ·64	·54	15 × ·64	·54	·46	·40	12	·46	·40
19000 and under 20000	6 × 3½ × ·44	·38	22 × ·66	·56	15 × ·66	·56	·46	·40	12	·46	·40
20000 and under 21000	6½ × 3½ × ·44	·38	23 × ·66	·56	16 × ·66	·56	·48	·40	13	·48	·40
21000 and under 22000	6½ × 3½ × ·44	·38	23 × ·68	·58	16 × ·68	·58	·48	·42	13	·48	·42
22000 and under 24000	6½ × 3½ × ·46	·38	24 × ·68	·58	17 × ·68	·58	·48	·42	14	·48	·42
24000 and under 26000	6½ × 3½ × ·46	·38	24 × ·70	·60	17 × ·70	·60	·48	·42	14	·48	·42
			Plate, Four Angles, Rider Plate and Foundation Plate.††								
26000 and under 28000	6½ × 3½ × ·48	·38	25 × ·70	·60	18 × ·70	·60	·50	·42	15	·50	·42
28000 and under 30000	6½ × 3½ × ·48	·38	26 × ·70	·60	19 × ·70	·60	·50	·42	16	·50	·42
30000 and under 32000	6½ × 3½ × ·50	·40	26 × ·72	·62	19 × ·72	·62	·50	·42	16	·50	·42
32000 and under 34000	6½ × 3½ × ·50	·40	27 × ·72	·62	20 × ·72	·62	·50	·42	17	·50	·42
34000 and under 36000	7 × 3½ × ·50	·40	28 × ·72	·62	21 × ·72	·62	·52	·44	18	·52	·44

TABLE 6.
(Concluded.)

LONGITUDINAL NUMBER. L × (B + D)	FLAT KEEL PLATE ANGLES. For ½ length Amidships.	FLAT KEEL PLATE ANGLES. Thickness at Ends.	SIDE KEELSONS. For ½ length Amidships.	SIDE KEELSONS. Thickness at Ends.	SIDE KEELSONS. Intercostal Plates.
	inches.	inches.	inches. Double Angles.	inches.	inches.
1200 and under 1400	3 × 3 × ·24	·24	3 × 3 × ·24	·24	·22
1400 and under 1700	3 × 3 × ·24	·24	3 × 3 × ·24	·24	·22
1700 and under 2000	3 × 3 × ·24	·24	3 × 3 × ·24	·24	·24
2000 and under 2400	3 × 3 × ·24	·24	3 × 3 × ·24	·24	·24
2400 and under 2800	3 × 3 × ·26	·26	3 × 3 × ·26	·26	·26
2800 and under 3200	3 × 3 × ·26	·26	3 × 3 × ·26	·26	·26
3200 and under 3700	3 × 3 × ·28	·28	3 × 3 × ·28	·28	·26
3700 and under 4200	3 × 3 × ·28	·28	3 × 3 × ·28	·28	·28
4200 and under 4700	3 × 3 × ·30	·30	3 × 3 × ·30	·30	·28
4700 and under 5200	3 × 3 × ·32	·32	3 × 3 × ·30	·30	·28
5200 and under 5800	3½ × 3½ × ·32	·32	3½ × 3 × ·30	·30	·30
5800 and under 6400	3½ × 3½ × ·34	·34	3½ × 3 × ·32	·32	·30
6400 and under 7000	3½ × 3½ × ·34	·34	3½ × 3 × ·32	·32	·30
7000 and under 7600	3½ × 3½ × ·36	·36	3½ × 3 × ·34	·34	·32
7600 and under 8200	3½ × 3½ × ·38	·38	4 × 3 × ·34	·34	·32
8200 and under 8800	3½ × 3½ × ·40	·40	4 × 3 × ·34	·34	·32
8800 and under 9400	3½ × 3½ × ·42	·40	4 × 3 × ·36	·34	·34
9400 and under 10000	3½ × 3½ × ·42	·40	4 × 3 × ·36	·34	·34
10000 and under 10600	3½ × 3½ × ·44	·42	4½ × 3 × ·36	·34	·34
10600 and under 11200	3½ × 3½ × ·46	·44	4½ × 3½ × ·36	·34	·36
11200 and under 11800	3½ × 3½ × ·48	·46	4½ × 3½ × ·36	·34	·36
11800 and under 12400	4 × 4 × ·48	·46	5 × 3½ × ·36	·34	·36
12400 and under 13000	4 × 4 × ·48	·46	5 × 3½ × ·38	·36	·38
13000 and under 13600	4 × 4 × ·48	·46	5 × 3½ × ·40	·36	·38
13600 and under 14200	4 × 4 × ·48	·46	5 × 3½ × ·40	·36	·38
14200 and under 14800	4 × 4 × ·50	·46	5½ × 3½ × ·40	·36	·38
14800 and under 15400	4 × 4 × ·50	·46	5½ × 3½ × ·40	·36	·38
15400 and under 16000	4 × 4 × ·50	·46	5½ × 3½ × ·42	·36	·38
16000 and under 16600	4 × 4 × ·52	·48	6 × 3½ × ·42	.36	·40
16600 and under 17200	4 × 4 × ·52	·48	6 × 3½ × ·42	·36	·40
			Double Bulb Angles.		
17200 and under 18000	4 × 4 × ·52	·48	7 × 3½ × ·42	·40	·40
18000 and under 19000	4 × 4 × ·54	·50	8 × 3½ × ·46	·44	·40
19000 and under 20000	4 × 4 × ·54	·50	9 × 3½ × ·50	·46	·40
20000 and under 21000	4 × 4 × ·56	·52	10 × 3½ × ·54	·48	·40
			Plate, Four Angles & Rider Plate.†		
21000 and under 22000	4 × 4 × ·56	·52	11 × ·50	·40	·42
22000 and under 24000	4 × 4 × ·58	·54	12 × ·52	·42	·42
24000 and under 26000	4 × 4 × ·58	·54	13 × ·54	·44	·42
26000 and under 28000	4½ × 4½ × ·58	·54	14 × ·56	·46	·42
28000 and under 30000	4½ × 4½ × ·60	·54	15 × ·58	·48	·42
30000 and under 32000	4½ × 4½ × ·60	·54	16 × ·60	·50	·42
32000 and under 34000	4½ × 4½ × ·60	·54	17 × ·62	·52	·42
34000 and under 36000	4½ × 4½ × ·60	·54	18 × ·64	·54	·44

* Where flat plate keels are adopted intercostal plates or centre through plates must be fitted.

** Where a centre through plate keelson is adopted foundation plates must be fitted of the thickness of the centre through plate, and extending not less than 12 inches on each side of the middle line.

† The thickness of rider plates is to be as required for the vertical plates, and the width is to be one inch greater than the sum of the wide flanges of the angles.

†† The foundation plate is to be 18 × ·50 inches.

SIDE STRINGERS.

TABLE 7.

LONGITUDINAL NUMBER. L × (B + D)	SIDE STRINGER ANGLES. inches.	SIDE STRINGER INTERCOSTAL PLATES. inches.	LONGITUDINAL NUMBER. L × (B + D)	SIDE STRINGER ANGLES. inches.	SIDE STRINGER INTERCOSTAL PLATES. inches.
1200 and under 2000	3 × 3 × ·24	·22	15400 and under 16000	5½ × 3½ × ·42	·38
2000 and under 2400	3 × 3 × ·24	·24	16000 and under 16600	6 × 3½ × ·42	·38
2400 and under 2800	3 × 3 × ·26	·24	16600 and under 17200	6 × 3½ × ·42	·40
2800 and under 3200	3 × 3 × ·26	·26	17200 and under 20000	6 × 3½ × ·44	·40
3200 and under 3700	3 × 3 × ·28	·26	20000 and under 22000	6½ × 3½ × ·44	·40
3700 and under 4200	3 × 3 × ·28	·28	22000 and under 26000	6½ × 3½ × ·46	·42
4200 and under 4700	3 × 3 × ·30	·28	26000 and under 30000	6½ × 3½ × ·48	·42
4700 and under 5200	3 × 3 × ·30	·30	30000 and under 32000	6½ × 3½ × ·50	·42
5200 and under 5800	3½ × 3 × ·30	·30	32000 and under 34000	6½ × 3½ × ·50	·44
5800 and under 6400	3½ × 3 × ·32	·30	34000 and under 38000	7 × 3½ × ·50	·44
6400 and under 7000	3½ × 3 × ·32	·32	38000 and under 42000	7 × 3½ × ·52	·44
7000 and under 7600	3½ × 3 × ·34	·32	42000 and under 45000	7 × 3½ × ·52	·46
7600 and under 8200	4 × 3 × ·34	·32	45000 and under 51000	7 × 3½ × ·54	·46
8200 and under 8800	4 × 3 × ·34	·34	51000 and under 54000	7 × 4 × ·54	·46
8800 and under 10000	4 × 3 × ·36	·34	54000 and under 57000	7 × 4 × ·56	·46
10000 and under 10600	4½ × 3 × ·36	·34	57000 and under 60000	7 × 4 × ·56	·48
10600 and under 11200	4½ × 3½ × ·36	·34	60000 and under 63000	7 × 4 × ·58	·48
11200 and under 11800	4½ × 3½ × ·36	·36	63000 and under 66000	7 × 4 × ·60	·48
11800 and under 12400	5 × 3½ × ·36	·36	66000 and under 70000	7 × 4 × ·62	·48
12400 and under 13000	5 × 3½ × ·38	·36	70000 and under 74000	8 × 4 × ·62	·48
13000 and under 13600	5 × 3½ × ·40	·36	74000 and under 78000	8 × 4 × ·64	·50
13600 and under 14200	5 × 3½ × ·40	·38	78000 and under 82000	8 × 4 × ·66	·50
14200 and under 15400	5½ × 3½ × ·40	·38			

Intercostal plates attached to the outside plating are to be fitted to the side stringers, where the depth of framing exceeds 3 inches by Table 2, and 4 inches by Table 3.

The number of side stringers to be as required by Tables 2 and 3.

DOUBLE BOTTOMS.

TABLE 8.

(See Continuation.)

LONGITUDINAL NUMBER. L × (B + D).	CENTRE GIRDER IN CELLULAR BOTTOM. Depth above Top of Keel.	CENTRE GIRDER Thickness. Half Length Amidships.	CENTRE GIRDER Thickness. At Ends.	CENTRE GIRDER Thickness. In Boiler Space.	SIDE GIRDERS. Thickness. In Holds. Half Length Amids.	SIDE GIRDERS. Thickness. In Holds. At Ends.	SIDE GIRDERS. Thickness. In Boil'r Space	MARGIN PLATE. Thickness. In Holds. Half Length Amidships.	MARGIN PLATE. Thickness. In Holds. At Ends.	MARGIN PLATE. Thickness. In Boiler Space.	FLOOR PLATES IN CELLULAR BOTTOM, AND BRACKETS. Thickness. In Holds. Half Length Amidships.	FLOOR PLATES Thickness. In Holds. At Ends.	FLOOR PLATES Thickness. In Boiler Space.	Height of Tank Side Brackets above Top of Margin Plate.	INNER BOTTOM PLATING. Middle Line Strake except in Boiler space. Breadth.	Middle Line Strake Thickness. Half Length Amidships.	Middle Line Strake Thickness. At Ends.	INNER BOTTOM Thickness. In Holds. Half Length Amidships.	INNER BOTTOM Thickness. In Holds. At Ends.	INNER BOTTOM Thickness. In Engine Space.	INNER BOTTOM Thickness. In Boiler Space including Middle Line Strake.
	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Under 7500	30	·36	·30	·46	·28	·28	·38	·30	·30	·40	·28	·28	·38	2	30	·34	·30	·28	·28	·32	·44
7500 and under 9000	31	·38	·32	·48	·28	·28	·38	·32	·32	·42	·30	·30	·40	5	31	·36	·32	·30	·28	·34	·46
9000 and under 10500	32	·40	·34	·50	·30	·30	·40	·34	·34	·44	·30	·30	·40	8	32	·38	·32	·30	·28	·34	·46
10500 and under 12000	33	·40	·34	·50	·30	·30	·40	·34	·34	·44	·30	·30	·40	11	33	·38	·32	·30	·28	·34	·46
12000 and under 14000	34	·42	·36	·52	·30	·30	·40	·36	·36	·46	·32	·32	·42	14	34	·40	·34	·32	·30	·36	·48
14000 and under 16000	35	·44	·36	·54	·32	·32	·42	·36	·36	·46	·32	·32	·42	17	35	·40	·34	·32	·30	·38	·48
16000 and under 18000	36	·46	·38	·56	·32	·32	·42	·38	·38	·48	·34	·34	·44	18	36	·42	·36	·34	·30	·40	·50
18000 and under 20000	37	·46	·38	·56	·34	·34	·44	·40	·40	·50	·34	·34	·44	19	37	·44	·36	·36	·32	·42	·52
20000 and under 22000	38	·48	·38	·58	·34	·34	·44	·40	·40	·50	·34	·34	·44	20	38	·44	·36	·36	·32	·44	·52
22000 and under 24000	39	·48	·38	·58	·34	·34	·44	·42	·42	·52	·36	·34	·46	21	39	·44	·36	·36	·32	·44	·52
24000 and under 26500	40	·48	·38	·58	·36	·34	·46	·42	·42	·52	·36	·34	·46	22	40	·46	·38	·38	·34	·46	·54
26500 and under 29000	41	·50	·40	·60	·36	·34	·46	·44	·44	·52	·38	·36	·48	23	41	·48	·40	·38	·34	·46	·54
29000 and under 31500	42	·50	·40	·60	·38	·36	·48	·46	·46	·56	·40	·36	·50	24	42	·50	·40	·40	·34	·48	·56
31500 and under 34000	43	·50	·40	·60	·40	·36	·50	·48	·48	·58	·40	·36	·50	25	43	·50	·40	·40	·36	·48	·56
34000 and under 36800	44	·52	·42	·60	·40	·36	·50	·48	·48	·58	·40	·36	·50	26	44	·52	·42	·40	·36	·50	·56
36800 and under 39600	45	·54	·44	·62	·40	·36	·50	·50	·50	·58	·42	·38	·52	27	45	·52	·42	·40	·36	·50	·56
39600 and under 42600	46	·56	·46	·62	·42	·38	·52	·50	·50	·58	·42	·38	·52	28	46	·54	·44	·42	·38	·52	·58
42600 and under 45600	47	·58	·46	·64	·42	·38	·52	·52	·52	·58	·44	·40	·54	29	47	·54	·44	·42	·38	·52	·58
45600 and under 48600	48	·60	·48	·64	·44	·40	·54	·52	·52	·58	·46	·40	·54	30	48	·56	·46	·44	·40	·54	·60
48600 and under 51800	49	·62	·48	·66	·46	·40	·54	·54	·54	·60	·46	·40	·54	31	49	·58	·46	·46	·40	·56	·62
51800 and under 55000	50	·64	·50	·68	·46	·40	·54	·56	·56	·60	·48	·42	·54	32	50	·58	·46	·48	·42	·58	·62
55000 and under 58400	51	·66	·50	·70	·48	·42	·54	·58	·58	·62	·48	·42	·54	33	51	·60	·46	·48	·42	·58	·64
58400 and under 61800	52	·68	·52	·72	·48	·42	·54	·60	·58	·64	·50	·42	·54	34	52	·60	·46	·50	·44	·60	·64
61800 and under 65400	53	·70	·54	·74	·50	·42	·54	·62	·58	·66	·50	·42	·54	35	52	·62	·48	·52	·44	·62	·66
65400 and under 69000	54	·72	·56	·76	·50	·42	·54	·64	·60	·68	·52	·42	·56	36	53	·64	·50	·52	·44	·62	·66
69000 and under 72800	55	·74	·58	·78	·52	·42	·56	·66	·62	·70	·52	·42	·56	37	53	·66	·52	·54	·44	·64	·66
72800 and under 76700	56	·78	·60	·82	·52	·42	·56	·68	·64	·72	·54	·44	·58	38	54	·68	·54	·54	·44	·64	·68
76700 and under 81000	57	·82	·62	·86	·54	·44	·58	·72	·66	·76	·54	·44	·58	39	54	·70	·58	·56	·46	·66	·70

Number of SIDE GIRDERS in CELLULAR DOUBLE BOTTOMS.

FLOOR PLATES AT EVERY FRAME. The number of Girders to be in accordance with the alternative breadth requiring the greater number. Rule Breadth of Vessel.	Breadth of Inner Bottom Amidships.	Number of Side Girders on each side exclusive of Margin Plate.	FLOOR PLATES AT ALTERNATE FRAMES. The number of Girders to be in accordance with the alternative breadth requiring the greater number. Rule Breadth of Vessel.	Breadth of Inner Bottom Amidships.	Number of Side Girders on each side exclusive of Margin Plate.
feet. feet.	feet. feet.		feet. feet.	feet. feet.	
Under 50	Under 36	1	Under 34	Under 28	1
50 and under 62	36 and under 48	2	34 and under 50	28 and under 36	2
62 and under 74	48 and under 60	3			
74 and under 86	60 and under 72	4			

TABLE 8.

DOUBLE BOTTOMS.

(Concluded.)

LONGITUDINAL NUMBER. L × (B + D).	DIMENSIONS OF ANGLE BARS (*a*). Angles connecting Centre Girder to Flat Keel Plate.	Angles at top of Centre Girder in Cellular Bottom.	Angles connecting Margin Plate to outside Plating.	Frames and Reversed Frames on Floors in Cellular Bottom, Side Girder Angles and Vertical Angles on Centre Girder and Margin Plate.	Vertical Angles connecting Floors and Side Girders.	Intermediate Frames where Floors are fitted at alternate Frames.	Intermediate Reversed Frames where Floors are fitted at alternate Frames.
	ins. ins. ins.	ins. ins. ins.	ins. ins. ins.	ins. ins. ins.	ins. ins. ins.	ins. ins. ins.	ins. ins. ins.
Under 7500	3½ × 3½ × ·36	3 × 3 × ·34	3 × 3 × ·30	3 × 3 × ·28	2½ × 2½ × ·28	3½ × 3 × ·30	3 × 2½ × ·26
7500 and under 9000	3½ × 3½ × ·40	3 × 3 × ·36	3 × 3 × ·32	3 × 3 × ·30	2½ × 2½ × ·30	3½ × 3 × ·32	3 × 2½ × ·28
9000 and under 10500	3½ × 3½ × ·44	3 × 3 × ·38	3½ × 3½ × ·34	3 × 3 × ·30	2½ × 2½ × ·30	4 × 3 × ·32	3 × 2½ × ·28
10500 and under 12000	3½ × 3½ × ·46	3 × 3 × ·38	3½ × 3½ × ·34	3 × 3 × ·30	2½ × 2½ × ·30	4 × 3 × ·34	3 × 3 × ·30
12000 and under 14000	4 × 4 × ·48	3 × 3 × ·40	3½ × 3½ × ·36	3 × 3 × ·32	2½ × 2½ × ·32	4½ × 3 × ·34	3 × 3 × ·30
14000 and under 16000	4 × 4 × ·50	3 × 3 × ·40	3½ × 3½ × ·36	3 × 3 × ·32	2½ × 2½ × ·32	4½ × 3 × ·36	3½ × 3 × ·32
16000 and under 18000	4 × 4 × ·52	3 × 3 × ·42	3½ × 3½ × ·38	3 × 3 × ·34	3 × 3 × ·34	5 × 3 × ·36	3½ × 3 × ·32
18000 and under 20000	4 × 4 × ·54	3½ × 3½ × ·44	3½ × 3½ × ·40	3½ × 3½ × ·34	3 × 3 × ·34	5 × 3½ × ·38	3½ × 3 × ·34
20000 and under 22000	4 × 4 × ·56	3½ × 3½ × ·44	3½ × 3½ × ·40	3½ × 3½ × ·36	3 × 3 × ·34	5 × 3½ × ·40	4 × 3 × ·36
22000 and under 24000	4 × 4 × ·58	3½ × 3½ × ·44	3½ × 3½ × ·42	3½ × 3½ × ·36	3 × 3 × ·36	5 × 3½ × ·42	4 × 3 × ·38
24000 and under 26500	4 × 4 × ·58	3½ × 3½ × ·46	3½ × 3½ × ·42	3½ × 3½ × ·36	3 × 3 × ·36	5½ × 3½ × ·42	4 × 3 × ·40
26500 and under 29000	4½ × 4½ × ·58	3½ × 3½ × ·48	3½ × 3½ × ·44	3½ × 3½ × ·38	3 × 3 × ·38	5½ × 3½ × ·44	4½ × 3 × ·42
29000 and under 31500	4½ × 4½ × ·60	3½ × 3½ × ·50	3½ × 3½ × ·46	3½ × 3½ × ·40	3 × 3 × ·40	5½ × 3½ × ·46	4½ × 3½ × ·44
31500 and under 34000	4½ × 4½ × ·60	3½ × 3½ × ·50	4 × 4 × ·48	3½ × 3½ × ·40	3 × 3 × ·40	5½ × 3½ × ·48	4½ × 3½ × ·46
34000 and under 36800	4½ × 4½ × ·60	3½ × 3½ × ·52	4 × 4 × ·48	3½ × 3½ × ·42	3 × 3 × ·40	—	—
36800 and under 39600	4½ × 4½ × ·60	3½ × 3½ × ·52	4 × 4 × ·50	3½ × 3½ × ·44	3 × 3 × ·42	—	—
39600 and under 42600	5 × 5 × ·60	3½ × 3½ × ·54	4 × 4 × ·50	3½ × 3½ × ·44	3 × 3 × ·42	—	—
42600 and under 45600	5 × 5 × ·62	3½ × 3½ × ·54	4 × 4 × ·52	3½ × 3½ × ·46	3 × 3 × ·44	—	—
45600 and under 48600	5 × 5 × ·62	3½ × 3½ × ·56	4 × 4 × ·52	3½ × 3½ × ·48	3 × 3 × ·46	—	—
48600 and under 51800	5 × 5 × ·62	3½ × 3½ × ·58	4 × 4 × ·54	3½ × 3½ × ·50	3 × 3 × ·46	—	—
51800 and under 55000	5 × 5 × ·64	3½ × 3½ × ·58	4 × 4 × ·56	3½ × 3½ × ·52	3½ × 3½ × ·48	—	—
55000 and under 58400	5 × 5 × ·66	3½ × 3½ × ·60	4 × 4 × ·58	3½ × 3½ × ·54	3½ × 3½ × ·48	—	—
58400 and under 61800	5 × 5 × ·68	3½ × 3½ × ·60	4 × 4 × ·60	3½ × 3½ × ·54	3½ × 3½ × ·50	—	—
61800 and under 65400	5 × 5 × ·70	3½ × 3½ × ·62	4 × 4 × ·62	3½ × 3½ × ·56	3½ × 3½ × ·50	—	—
65400 and under 69000	5 × 5 × ·72	3½ × 3½ × ·64	4 × 4 × ·64	4 × 4 × ·56	3½ × 3½ × ·52	—	—
69000 and under 72800	5 × 5 × ·74	4 × 4 × ·66	4 × 4 × ·66	4 × 4 × ·58	3½ × 3½ × ·52	—	—
72800 and under 76700	5 × 5 × ·76	4 × 4 × ·68	4 × 4 × ·68	4 × 4 × ·60	3½ × 3½ × ·54	—	—
76700 and under 81000	5 × 5 × ·80	4 × 4 × ·72	4 × 4 × ·72	4 × 4 × ·60	3½ × 3½ × ·54	—	—

(*a*) All angle bars in boiler space (except those attached to outside plating and covered with cement) to be ·10 of an inch thicker than given in the above Table.

In all cases where flanged plates are adopted as a substitute for fitting angles on the edges of floors, brackets, intercostal plates, &c., the *faying surface* should not be less than the breadth of the flange of the angle required by the rule.

Where floors and intercostal plates are flanged on their lower edges as a substitute for fitting attachment angles to the outside plating, such plates are to be ·02 of an inch thicker than that given in the Table.

All angles (except margin angles) may be reduced in thickness as follows :—

Thickness for half length amidship ..	·40 and under ·50	·50 and under ·60	·60 and under ·70	·70 and under ·80
Reduction at ends	·02	·04	·06	·08

The margin angles where ·60 and above in thickness may be reduced at the ends of the vessel to the same extent as the margin plates to which they are attached.

The floors are to be attached to the centre girder by double angles throughout the engine and boiler spaces in all cases, and where the transverse number is 66 or above, they are to be attached by double angles for one-half the vessel's length amidships.

Where double bottoms are constructed with girders on top of ordinary floors, the frames and reversed frames on the floors are to be of the same thickness as the floor plates to which they are attached, and the breadth of flanges to be as required for frames and reversed frames on floors in cellular bottoms.

Lloyd's Register of British and Foreign Shipping, London.—*15th December, 1910.*

Depths of MARGIN PLATE OF DOUBLE BOTTOMS AND ATTACHMENTS of side framing and tank side brackets to margin plate and inner bottom plating. TABLE 9.

(See Continuation.)

TRANSVERSE NUMBER. B + D.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF MARGIN PLATE TO TOP OF LOWEST TIER OF BEAMS AT SIDE. Feet. 7 and under 10			Feet. 10 and under 13			Feet. 13 and under 16			Feet. 16 and under 19		
	Depth of Margin Plate (exclusive of flange).	Attachment outside Margin Plate. (a) Angle Attachment.	Gussets to Floor Brackets.	Depth of Margin Plate (exclusive of flange).	Attachment outside Margin Plate. (a) Angle Attachment.	Gussets to Floor Brackets.	Depth of Margin Plate (exclusive of flange).	Attachment outside Margin Plate. (a) Angle Attachment.	Gussets to Floor Brackets.	Depth of Margin Plate (exclusive of flange).	Attachment outside Margin Plate. (a) Angle Attachment.	Gussets to Floor Brackets.
feet.	inches.			inches.			inches.			inches.		
Under 45	19	Single angle.	—	20	Single angle.	—	21	Single angle.	—	—	—	—
45 and under 48	20	”	—	21	”	—	22	”	—	—	—	—
48 and under 51	21	”	—	22	”	—	23	”	—	24	Single angle.	—
51 and under 54	22	”	—	23	”	—	24	”	—	25	”	—
54 and under 57	23	”	—	24	”	—	25	”	—	25	Double angles from collision bulkhead to one-fourth vessel's length from stem.	Every fifth frame.
57 and under 60	24	”	—	25	”	—	25	”	—	26	”	”
60 and under 63	25	”	—	25	”	—	26	Double angles from collision bulkhead to one-fourth vessel's length from stem.	—	27	”	”
63 and under 66	25	”	—	26	Double angles from collision bulkhead to one-fourth vessel's length from stem.	—	27	”	Every fifth frame.	28	”	Every fourth frame.
66 and under 69	26	Double angles from collision bulkhead to one-fourth vessel's length from stem.	—	27	”	Every fifth frame.	28	”	”	29	Double angles from collision bulkhead to after end of engine room.	”
69 and under 72	27	”	Every fifth frame.	28	”	”	29	”	Every fourth frame.	30	”	”
72 and under 75	28	”	”	29	”	Every fourth frame.	30	Double angles from collision bulkhead to after end of engine room.	”	31	”	Every third frame.
75 and under 78	29	”	Every fourth frame	30	Double angles from collision bulkhead to after end of engine room.	”	31	”	”	32	”	”
78 and under 81	30	Double angles from collision bulkhead to after end of engine room.	”	31	”	”	32	”	Every third frame.	33	”	”
81 and under 84	31	”	”	32	”	Every third frame.	33	”	”	34	”	”
84 and under 87	32	”	Every third frame.	33	”	”	34	”	”	35	”	Every second frame.
87 and under 90	33	”	”	34	”	”	35	”	Every second frame.	36	”	”
90 and under 93	34	”	”	35	”	Every second frame.	36	”	”	37	Double angles fore and aft.	”
93 and under 96	35	”	Every second frame.	36	”	”	37	Double angles fore and aft.	”	38	”	”
96 and under 99	36	”	”	37	Double angles fore and aft.	”	38	”	”	39	”	Every frame.
99 and under 102	37	Double angles fore and aft.	”	38	”	”	39	”	”	40	”	”
102 and under 105	38	”	”	39	”	”	40	”	Every frame.	41	”	”
105 and under 108	39	”	”	40	”	Every frame.	41	”	”	42	”	”
108 and under 114	40	”	Every frame.	41	”	”	42	”	”	43	”	”
114 and under 122	41	”	”	42	”	”	43	”	”	44	”	”
122 and under 130	42	”	”	43	”	”	44	”	”	—	—	—

Depths of MARGIN PLATE OF DOUBLE BOTTOMS AND ATTACHMENTS of side framing and tank side brackets to margin plate and inner bottom plating.

TABLE 9.

(Concluded.)

TRANSVERSE NUMBER. B + D.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF MARGIN PLATE TO TOP OF LOWEST TIER OF BEAMS AT SIDE.								
	Feet. 19 and under 22			Feet. 22 and under 25			Feet. 25 and under 27		
	Depth of Margin Plate (exclusive of flange).	Attachment outside Margin Plate. (*a*) Angle Attachment.	Attachment outside Margin Plate. (*a*) Gussets to Floor Brackets.	Depth of Margin Plate (exclusive of flange).	Attachment outside Margin Plate. (*a*) Angle Attachment.	Attachment outside Margin Plate. (*a*) Gussets to Floor Brackets.	Depth of Margin Plate (exclusive of flange).	Attachment outside Margin Plate. (*a*) Angle Attachment.	Attachment outside Margin Plate. (*a*) Gussets to Floor Brackets.
feet.	inches.			inches.			inches.		
Under 45	—	—	—	—	—	—	—	—	—
45 and under 48	—	—	—	—	—	—	—	—	—
48 and under 51	—	—	—	—	—	—	—	—	—
51 and under 54	—	—	—	—	—	—	—	—	—
54 and under 57	26	Double angles from collision bulkhead to one-fourth vessel's length from stem.	Every fourth frame.	—	—	—	—	—	—
57 and under 60	27	”	”	—	—	—	—	—	—
60 and under 63	28	Double angles from collision bulkhead to after end of engine room.	”	29	Double angles from collision bulkhead to after end of engine room.	Every third frame.	—	—	—
63 and under 66	29	”	”	30	”	”	—	—	—
66 and under 69	30	”	Every third frame.	31	”	Every second frame.	32	Double angles fore and aft.	Every frame.
69 and under 72	31	”	”	32	”	”	33	”	”
72 and under 75	32	”	”	33	”	”	34	”	”
75 and under 78	33	”	”	34	Double angles fore and aft.	”	35	”	”
78 and under 81	34	”	Every second frame.	35	”	”	36	”	”
81 and under 84	35	”	”	36	”	Every frame.	37	”	”
84 and under 87	36	Double angles fore and aft.	”	37	”	”	38	”	”
87 and under 90	37	”	”	38	”	”	39	”	”
90 and under 93	38	”	Every frame.	39	”	”	40	”	”
93 and under 96	39	”	”	40	”	”	41	”	”
96 and under 99	40	”	”	41	”	”	—	—	—
99 and under 102	41	”	”	42	”	”	—	—	—
102 and under 105	42	”	”	43	”	”	—	—	—
105 and under 108	43	”	”	—	—	—	—	—	—
108 and under 114	44	”	”	—	—	—	—	—	—
114 and under 122	—	—	—	—	—	—	—	—	—
122 and under 130	—	—	—	—	—	—	—	—	—

CONNECTION OF FLOORS AND OUTSIDE BRACKETS TO MARGIN PLATES.		
Depth of Margin Plate.	Number of Rivets in each flange of vertical angles.	Diameter of Rivets.
inches. inches.		inch.
19 and under 24	5	$\frac{3}{4}$
24 and under 28	6	$\frac{3}{4}$
28 and under 30	6	$\frac{7}{8}$
30 and under 35	7	$\frac{7}{8}$
35 and under 40	8	$\frac{7}{8}$
40 and under 44	9	$\frac{7}{8}$

Where double angles are fitted there may be one rivet less than required above.

(*a*) If it is desired to dispense with the double angles, other efficient methods of connection may be submitted for approval.

In high powered vessels, when the Committee may consider it necessary, the gusset plates are to be fitted on every frame in way of the machinery space, or a continuous plate may be fitted in lieu of gusset plates.

The breadth of the margin plate may be gradually reduced abaft the three-fifths length amidships towards the after end of the tank where it may be 15 per cent. less than the midship depth.

All web frames are to be attached to the margin plate by double angles. Where web frames are 15 inches and above in depth, they are also to be attached to the inner bottom plating by gusset plates or angles. Where the web frames are 17 inches and under 20 inches in depth, an additional gusset is to be fitted to the frame midway between the webs; where 20 inches and under 26 inches in depth, gussets are to be fitted at every alternate frame; and where 26 inches and above in depth, a gusset is to be fitted at every frame.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.
17th June, 1909.

Thickness of PLATING and dimensions of VERTICAL STIFFENING for WATERTIGHT BULKHEADS.

TABLE 10.

(See Continuation.)

DEPTH OF BULKHEAD AT MIDDLE LINE FROM UPPER DECK TO TOP OF FLOORS OR DOUBLE BOTTOM; ALSO TO LOWER PART OF ANY EFFICIENT 'TWEEN DECKS, FOR LOWER 'TWEEN DECK STIFFENERS.	THICKNESS OF BULKHEAD PLATING.		ANGLES ATTACHING BULKHEADS TO OUTSIDE PLATING, DOUBLE BOTTOM AND DECKS.			DEPTH AT CENTRE FROM LOWEST DECK TO TOP OF FLOORS OR INNER BOTTOM PLATING: ALSO HEIGHT OF 'TWEEN DECKS FOR LOWER 'TWEEN DECK STIFFENERS.		
	At Floor or Double Bottom.	At Upper Deck.	Double Angles to Outside Plating and Double Bottom, and Single Angles to Deck.	Single Angles to Outside Plating and Double Bottom.		Feet. Under 8	Feet. 8 and under 9	Feet. 9 and under 10
Feet.	Inches.	Inches.	Inches.	Inches.		Inches.	Inches.	Inches
Under 8	·26	·26	—	3½ × 3½ × ·40	Angle	3 × 2½ × ·30		
8 and under 10	·26	·26	—	3½ × 3½ × ·40	Angle		3½ × 2½ × ·30	4 × 2½ × ·30
10 and under 12	·26	·26	—	3½ × 3½ × ·40	Angle			
12 and under 14	·28	·26	—	4 × 4 × ·40	Angle	3½ × 3 × ·36		
14 and under 16	·30	·26	3 × 3 × ·30	4 × 4 × ·42	Angle	4 × 3 × ·36	4½ × 3 × ·36	5 × 3 × ·38
16 and under 18	·30	·26	3½ × 3½ × ·30	4½ × 4½ × ·42	Angle	4½ × 3 × ·36	5 × 3 × ·36	5 × 3 × ·40
18 and under 20	·32	·28	3½ × 3½ × ·32	4½ × 4½ × ·44	Angle or Bulb Angle Flanged Plate	5 × 3 × ·36	5 × 3 × ·38	5½ × 3 × ·36 6 × 3
20 and under 22	·32	·28	3½ × 3½ × ·32	4½ × 4½ × ·46	Angle or Bulb Angle Flanged Plate	5 × 3 × ·38	5 × 3 × ·40	5½ × 3 × ·38 6 × 3
22 and under 24	·34	·30	3½ × 3½ × ·34	5 × 5 × ·46	Angle or Bulb Angle Flanged Plate	5 × 3 × ·40	5½ × 3 × ·36 6 × 3	5½ × 3 × ·38 6 × 3
24 and under 26	·34	·30	3½ × 3½ × ·34	5 × 5 × ·48	Angle or Bulb Angle Flanged Plate	5½ × 3 × ·42	5½ × 3 × ·38 6 × 3	5½ × 3 × ·40 6 × 3
26 and under 28	·36	·30	3½ × 3½ × ·36	5 × 5 × ·50	Bulb Angle Flanged Plate	5½ × 3 × ·38 6 × 3	5½ × 3 × ·40 6 × 3	6 × 3 × ·40 7 × 3
28 and under 30	·36	·30	4 × 4 × ·36	5 × 5 × ·52	Bulb Angle Flanged Plate	5½ × 3 × ·38 6 × 3	6 × 3 × ·40 6 × 3	6½ × 3 × ·40 7 × 3
30 and under 32	·38	·30	4 × 4 × ·38	5 × 5 × ·54	Bulb Angle Flanged Plate	5½ × 3 × ·40 6 × 3	6 × 3 × ·40 6 × 3	6½ × 3 × ·40 7 × 3
32 and under 34	·40	·30	4 × 4 × ·40	5 × 5 × ·56	Bulb Angle Flanged Plate	5½ × 3 × ·40 6 × 3	6 × 3 × ·40 6 × 3	7 × 3 × ·40 7 × 3
34 and under 36	·40	·30	4 × 4 × ·40	6 × 6 × ·56	Bulb Angle Flanged Plate	5½ × 3 × ·40 6 × 3	6 × 3 × ·40 7 × 3	7 × 3 × ·40 8 × 3
36 and under 38	·42	·30	4 × 4 × ·42	6 × 6 × ·58	Bulb Angle Flanged Plate	6 × 3 × ·40 6 × 3	6½ × 3 × ·40 7 × 3	7 × 3 × ·40 8 × 3
38 and under 40	·42	·30	4½ × 4½ × ·44	6 × 6 × ·60	Bulb Angle Flanged Plate	6 × 3 × ·40 6 × 3	6½ × 3 × ·40 7 × 3	7 × 3 × ·42 8 × 3
40 and under 42	·44	·30	4½ × 4½ × ·46	6 × 6 × ·62	Bulb Angle Flanged Plate	6½ × 3 × ·40 7 × 3	7 × 3 × ·40 8 × 3	7½ × 3 × ·44 9 × 3
42 and under 44	·44	·30	4½ × 4½ × ·46	6 × 6 × ·62	Bulb Angle Flanged Plate	6½ × 3 × ·40 7 × 3	7 × 3 × ·40 8 × 3	7½ × 3 × ·44 9 × 3
44 and under 46	·46	·30	4½ × 4½ × ·48	6 × 6 × ·64	Bulb Angle Flanged Plate	7 × 3 × ·40 7 × 3	7½ × 3 × ·42 8 × 3	8 × 3 × ·44 9 × 3
46 and under 48	·46	·30	4½ × 4½ × ·48	6 × 6 × ·64	Bulb Angle Channel Flanged Plate	7 × 3 × ·40 7 × 3	7½ × 3 × ·44 8 × 3	8 × 3 × ·46 7 × 3 × 3 × ·40 9 × 3
48 and under 50	·46	·30	4½ × 4½ × ·50	6 × 6 × ·64	Bulb Angle Channel Flanged Plate	7½ × 3 × ·42 7 × 3	8 × 3 × ·44 8 × 3	8½ × 3 × ·46 7½ × 3 × 3 × ·40 9 × 3

For Footnotes see page 184.

VERTICAL STIFFENING for WATERTIGHT BULKHEADS.

TABLE 10.

(See Continuation.)

DEPTH OF BULKHEAD AT MIDDLE LINE FROM UPPER DECK TO TOP OF FLOORS OR DOUBLE BOTTOM; ALSO TO LOWER PART OF ANY EFFICIENT 'TWEEN DECKS, FOR LOWER 'TWEEN DECK STIFFENERS.		DEPTH AT CENTRE FROM LOWEST DECK TO TOP OF FLOORS OR INNER BOTTOM PLATING; ALSO HEIGHT OF 'TWEEN DECKS FOR LOWER 'TWEEN DECK STIFFENERS.				
		Feet. 10 and under 11	Feet. 11 and under 12	Feet. 12 and under 13	Feet. 13 and under 14	Feet. 14 and under 15
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.
10 and under 12	Angle	4½ × 3 × ·30	4½ × 3 × ·34			
12 and under 14	Angle			5 × 3 × ·36	5½ × 3 × ·40	
14 and under 16	Angle or Bulb Angle	5 × 3 × ·40				5½ × 3 × ·36
16 and under 18	Angle or Bulb Angle	5½ × 3 × ·40	5½ × 3 × ·38			
18 and under 20	Bulb Angle	5½ × 3 × ·38	5½ × 3 × ·40	6 × 3 × ·40	6 × 3 × ·40	
	Flanged Plate	6 × 3	7 × 3	7 × 3	7 × 3	
20 and under 22	Bulb Angle	5½ × 3 × ·40	6 × 3 × ·40	6 × 3 × ·40	6½ × 3 × ·40	7 × 3 × ·42
	Flanged Plate	6 × 3	7 × 3	7 × 3	7 × 3	8 × 3
22 and under 24	Bulb Angle	6 × 3 × ·40	6 × 3 × ·40	6½ × 3 × ·40	7 × 3 × ·42	7 × 3 × ·44
	Flanged Plate	7 × 3	7 × 3	7 × 3	8 × 3	9 × 3
24 and under 26	Bulb Angle	6 × 3 × ·40	6½ × 3 × ·40	7 × 3 × ·42	7 × 3 × ·44	7½ × 3 × ·46
	Flanged Plate	7 × 3	7 × 3	8 × 3	9 × 3	9 × 3
26 and under 28	Bulb Angle	6½ × 3 × ·40	7 × 3 × ·42	7 × 3 × ·44	7½ × 3 × ·46	8 × 3 × ·46
	Channel					7 × 3 × 3 × ·40
	Flanged Plate	7 × 3	8 × 3	9 × 3	9 × 3	10 × 3
28 and under 30	Bulb Angle	7 × 3 × ·40	7 × 3 × ·42	7½ × 3 × ·44	8 × 3 × ·44	8½ × 3 × ·46
	Channel					7½ × 3 × 3 × ·40
	Flanged Plate	7 × 3	8 × 3	9 × 3	10 × 3	10 × 3½
30 and under 32	Bulb Angle	7 × 3 × ·42	7½ × 3 × ·44	8 × 3 × ·44	8½ × 3 × ·46	9 × 3 × ·46
	Channel				7½ × 3 × 3 × ·40	8 × 3 × 3 × ·40
	Flanged Plate	8 × 3	9 × 3	10 × 3	10 × 3½	11 × 3½
32 and under 34	Bulb Angle	7 × 3 × ·44	7½ × 3 × ·44	8 × 3 × ·46	8½ × 3 × ·46	9 × 3 × ·50
	Channel			7 × 3 × 3 × ·40	7½ × 3 × 3 × ·40	8 × 3 × 3 × ·44
	Flanged Plate	8 × 3	9 × 3	10 × 3	10 × 3½	11 × 3½
34 and under 36	Bulb Angle	7½ × 3 × ·44	8 × 3 × ·44	8½ × 3 × ·46	9 × 3 × ·46	9 × 3 × ·50
	Channel			7½ × 3 × 3 × ·40	8 × 3 × 3 × ·40	8 × 3 × 3 × ·44
	Flanged Plate	9 × 3	10 × 3	10 × 3½	11 × 3½	12 × 3½
36 and under 38	Bulb Angle	7½ × 3 × ·44	8 × 3 × ·46	8½ × 3 × ·46	9 × 3 × ·50	9½ × 3½ × ·50
	Channel		7 × 3 × 3 × ·40	7½ × 3 × 3 × ·40	8 × 3 × 3 × ·44	8½ × 3 × 3 × ·46
	Flanged Plate	9 × 3	10 × 3	10 × 3½	11 × 3½	12 × 3½
38 and under 40	Bulb Angle	7½ × 3 × ·46	8½ × 3 × ·46	9 × 3 × ·46	9 × 3 × ·50	9½ × 3½ × ·52
	Channel		7½ × 3 × 3 × ·40	8 × 3 × 3 × ·40	8 × 3 × 3 × ·44	8½ × 3½ × 3½ × ·46
	Flanged Plate	9 × 3	10 × 3	11 × 3½	11 × 3½	12 × 3½
40 and under 42	Bulb Angle	7½ × 3 × ·46	8½ × 3 × ·46	9 × 3 × ·50	9½ × 3½ × ·52	10 × 3½ × ·52
	Channel		7½ × 3 × 3 × ·40	8 × 3 × 3 × ·44	8½ × 3½ × 3½ × ·46	9 × 3½ × 3½ × ·46
	Flanged Plate	10 × 3	10 × 3½	11 × 3½	12 × 3½	12 × 4
42 and under 44	Bulb Angle	8 × 3 × ·46	9 × 3 × ·46	9 × 3 × ·52	9½ × 3½ × ·52	10 × 3½ × ·54
	Channel	7 × 3 × 3 × ·40	8 × 3 × 3 × ·40	8 × 3 × 3 × ·46	8½ × 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·46
	Flanged Plate	10 × 3	10 × 3½	11 × 3½	12 × 3½	12 × 4
44 and under 46	Bulb Angle	8½ × 3 × ·46	9 × 3 × ·46	9½ × 3½ × ·50	10 × 3½ × ·52	10 × 3½ × ·56
	Channel	7½ × 3 × 3 × ·40	8 × 3 × 3 × ·40	8½ × 3 × 3 × ·46	9 × 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·48
	Flanged Plate	10 × 3	10 × 3½	11 × 3½	12 × 3½	12 × 4
46 and under 48	Bulb Angle	9 × 3 × ·46	9 × 3 × ·50	9½ × 3½ × ·50	10 × 3½ × ·54	10½ × 3½ × ·56
	Channel	8 × 3 × 3 × ·40	8 × 3 × 3 × ·44	8½ × 3 × 3 × ·46	9½ × 3½ × 3½ × ·46	10 × 3½ × 3½ × ·48
	Flanged Plate	10 × 3	10 × 3½	11 × 3½	12 × 3½	12 × 4
48 and under 50	Bulb Angle	9 × 3 × ·46	9½ × 3½ × ·50	10 × 3½ × ·52	10 × 3½ × ·56	10½ × 3½ × ·58
	Channel	8 × 3 × 3 × ·40	8½ × 3 × 3 × ·46	9 × 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·48	10½ × 3½ × 3½ × ·48
	Flanged Plate	10 × 3	10 × 3½	11 × 3½	12 × 3½	12 × 4

For Footnotes see page 184.

VERTICAL STIFFENING for WATERTIGHT BULKHEADS.

TABLE 10.

(See Continuation.)

DEPTH OF BULKHEAD AT MIDDLE LINE FROM UPPER DECK TO TOP OF FLOORS OR DOUBLE BOTTOM.		DEPTH AT CENTRE FROM LOWEST DECK TO TOP OF FLOORS OR INNER BOTTOM PLATING.			
		Feet. 15 and under 16	Feet. 16 and under 17	Feet. 17 and under 18	Feet. 18 and under 19
Feet.		Inches.	Inches.	Inches.	Inches.
14 and under 16	Bulb Angle	5½ × 3 × ·40			
	Flanged Plate	7 × 3			
16 and under 18	Bulb Angle		6½ × 3 × ·40	7 × 3 × ·40	
	Flanged Plate		8 × 3	9 × 3	
18 and under 20	Bulb Angle				7 × 3 × ·46
	Flanged Plate				9 × 3
20 and under 22	Bulb Angle	7 × 3 × ·44			
	Flanged Plate	8 × 3			
22 and under 24	Bulb Angle	7½ × 3 × ·46	8 × 3 × ·46	8½ × 3 × ·46	
	Channel		7 × 3 × 3 × ·40	7½ × 3 × 3 × ·40	
	Flanged Plate	9 × 3	10 × 3	10 × 3½	
24 and under 26	Bulb Angle	8 × 3 × ·46	8½ × 3 × ·46	9 × 3 × ·46	9 × 3 × ·50
	Channel	7 × 3 × 3 × ·40	7½ × 3 × 3 × ·40	8 × 3 × 3 × ·40	8 × 3 × 3 × ·44
	Flanged Plate	10 × 3	10 × 3½	11 × 3½	11 × 3½
26 and under 28	Bulb Angle	8½ × 3 × ·46	9 × 3 × ·46	9 × 3 × ·50	9½ × 3½ × ·50
	Channel	7½ × 3 × 3 × ·40	8 × 3 × 3 × ·40	8 × 3 × 3 × ·44	8½ × 3 × 3 × ·46
	Flanged Plate	10 × 3½	11 × 3½	11 × 3½	12 × 3½
28 and under 30	Bulb Angle	9 × 3 × ·46	9 × 3 × ·50	9½ × 3½ × ·50	9½ × 3½ × ·52
	Channel	8 × 3 × 3 × ·40	8 × 3 × 3 × ·44	8½ × 3 × 3 × ·46	8½ × 3½ × 3½ × ·46
	Flanged Plate	11 × 3½	11 × 3½	12 × 3½	12 × 4
30 and under 32	Bulb Angle	9 × 3 × ·50	9½ × 3½ × ·50	9½ × 3½ × ·52	10 × 3½ × ·52
	Channel	8 × 3 × 3 × ·44	8½ × 3 × 3 × ·46	8½ × 3½ × 3½ × ·46	9 × 3½ × 3½ × ·46
	Flanged Plate	11 × 3½	12 × 3½	12 × 4	12 × 4
32 and under 34	Bulb Angle	9½ × 3½ × ·50	9½ × 3½ × ·52	10 × 3½ × ·52	10 × 3½ × ·54
	Channel	8½ × 3 × 3 × ·46	8½ × 3½ × 3½ × ·46	9 × 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·46
	Flanged Plate	12 × 3½	12 × 4	12 × 4	13 × 4
34 and under 36	Bulb Angle	9½ × 3½ × ·52	10 × 3½ × ·52	10 × 3½ × ·54	10½ × 3½ × ·56
	Channel	8½ × 3½ × 3½ × ·46	9 × 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·46	10 × 3½ × 3½ × ·48
	Flanged Plate	12 × 3½	12 × 4	13 × 4	13 × 4
36 and under 38	Bulb Angle	10 × 3½ × ·52	10 × 3½ × ·54	10½ × 3½ × ·56	10½ × 3½ × ·60
	Channel	9 × 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·46	10 × 3½ × 3½ × ·48	10½ × 3½ × 3½ × ·50
	Flanged Plate	12 × 4	13 × 4	13 × 4	14 × 4
38 and under 40	Bulb Angle	10 × 3½ × ·54	10½ × 3½ × ·56	10½ × 3½ × ·60	11 × 3½ × ·60
	Channel	9½ × 3½ × 3½ × ·46	10 × 3½ × 3½ × ·48	10½ × 3½ × 3½ × ·50	11 × 3½ × 3½ × ·50
	Flanged Plate	12 × 4	13 × 4	13 × 4	14 × 4
40 and under 42	Bulb Angle	10 × 3½ × ·56	10½ × 3½ × ·58	11 × 3½ × ·60	11½ × 3½ × ·60
	Channel	9½ × 3½ × 3½ × ·48	10½ × 3½ × 3½ × ·48	11 × 3½ × 3½ × ·50	11½ × 3½ × 3½ × ·50
	Flanged Plate	12 × 4	13 × 4	14 × 4	14 × 4
42 and under 44	Bulb Angle	10½ × 3½ × ·56	10½ × 3½ × ·60	11 × 3½ × ·60	11½ × 3½ × ·60
	Channel	10 × 3½ × 3½ × ·48	10½ × 3½ × 3½ × ·50	11 × 3½ × 3½ × ·50	11½ × 3½ × 3½ × ·50
	Flanged Plate	13 × 4	13 × 4	14 × 4	15 × 4
44 and under 46	Bulb Angle	10½ × 3½ × ·58	11 × 3½ × ·60	11½ × 3½ × ·60	12 × 3½ × ·60
	Channel	10½ × 3½ × 3½ × ·48	11 × 3½ × 3½ × ·50	11½ × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·50
	Flanged Plate	13 × 4	14 × 4	14 × 4	15 × 4
46 and under 48	Bulb Angle	11 × 3½ × ·58	11½ × 3½ × ·60	12 × 3½ × ·60	12 × 3½ × ·66
	Channel	11 × 3½ × 3½ × ·48	11½ × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·56
	Flanged Plate	13 × 4	14 × 4	15 × 4	15 × 4
48 and under 50	Bulb Angle	11 × 3½ × ·60	11½ × 3½ × ·60	12 × 3½ × ·60	12 × 3½ × ·66
	Channel	11 × 3½ × 3½ × ·50	11½ × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·56
	Flanged Plate	13 × 4	14 × 4	15 × 4	15 × 4

For Footnotes see page 184.

VERTICAL STIFFENING for WATERTIGHT BULKHEADS.

TABLE 10.

(See Continuation.)

DEPTH OF BULKHEAD AT MIDDLE LINE FROM UPPER DECK TO TOP OF FLOORS OR DOUBLE BOTTOM.		DEPTH AT CENTRE FROM LOWEST DECK TO TOP OF FLOORS OR INNER BOTTOM PLATING.			
		Feet. 19 and under 20	Feet. 20 and under 21	Feet. 21 and under 22	Feet. 22 and under 23
Feet.		Inches.	Inches.	Inches.	Inches.
18 and under 20	Bulb Angle	7½ × 3 × ·46			
	Flanged Plate	10 × 3			
20 and under 22	Bulb Angle		8 × 3 × ·46	8½ × 3 × ·46	
	Channel		7 × 3 × 3 × ·40	7½ × 3 × 3 × ·40	
	Flanged Plate		10 × 3½	11 × 3½	
22 and under 24	Bulb Angle				9 × 3 × ·50
	Channel				8 × 3 × 3 × ·44
	Flanged Plate				12 × 3½
24 and under 26	Bulb Angle	9½ × 3½ × ·50			
	Channel	8½ × 3 × 3 × ·46			
	Flanged Plate	12 × 3½			
26 and under 28	Bulb Angle	9½ × 3½ × ·52	10 × 3½ × ·52	10 × 3½ × ·54	
	Channel	8½ × 3½ × 3½ × ·46	9 × 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·46	
	Flanged Plate	12 × 4	12 × 4	13 × 4	
28 and under 30	Bulb Angle	10 × 3½ × ·52	10 × 3½ × ·54	10½ × 3½ × ·56	10½ × 3½ × ·60
	Channel	9 × 3½ × 3½ × ·46	9½ × 3½ × 3½ × ·46	10 × 3½ × 3½ × ·48	10½ × 3½ × 3½ × ·50
	Flanged Plate	12 × 4	13 × 4	13 × 4	14 × 4
30 and under 32	Bulb Angle	10 × 3½ × ·54	10½ × 3½ × ·56	10½ × 3½ × ·60	11 × 3½ × ·60
	Channel	9½ × 3½ × 3½ × ·46	10 × 3½ × 3½ × ·48	10½ × 3½ × 3½ × ·50	11 × 3½ × 3½ × ·50
	Flanged Plate	13 × 4	13 × 4	14 × 4	15 × 4
32 and under 34	Bulb Angle	10½ × 3½ × ·56	10½ × 3½ × ·60	11 × 3½ × ·60	11½ × 3½ × ·60
	Channel	10 × 3½ × 3½ × ·48	10½ × 3½ × 3½ × ·50	11 × 3½ × 3½ × ·50	11½ × 3½ × 3½ × ·50
	Flanged Plate	13 × 4	14 × 4	14 × 4	15 × 4
34 and under 36	Bulb Angle	10½ × 3½ × ·60	11 × 3½ × ·60	11½ × 3½ × ·60	12 × 3½ × ·60
	Channel	10½ × 3½ × 3½ × ·50	11 × 3½ × 3½ × ·50	11½ × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·50
	Flanged Plate	14 × 4	14 × 4	15 × 4	16 × 4
36 and under 38	Bulb Angle	11 × 3½ × ·60	11½ × 3½ × ·60	12 × 3½ × ·60	12 × 3½ × ·64
	Channel	11 × 3½ × 3½ × ·50	11½ × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·54
	Flanged Plate	14 × 4	15 × 4	15 × 4	16 × 5
38 and under 40	Bulb Angle	11½ × 3½ × ·60	12 × 3½ × ·60	12 × 3½ × ·64	
	Channel	11½ × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·54	12 × 4 × 4 × ·54
	Flanged Plate	14 × 4	15 × 4	16 × 4	16 × 5
40 and under 42	Bulb Angle	12 × 3½ × ·60	12 × 3½ × ·64		
	Channel	12 × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·54	12 × 4 × 4 × ·54	12 × 4 × 4 × ·60
	Flanged Plate	15 × 4	15 × 4	16 × 4	16 × 5
42 and under 44	Bulb Angle	12 × 3½ × ·60	12 × 3½ × ·66		
	Channel	12 × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·56	12 × 4 × 4 × ·56	
	Flanged Plate	15 × 4	16 × 4	16 × 4	
44 and under 46	Bulb Angle	12 × 3½ × ·66			
	Channel	12 × 3½ × 3½ × ·56	12 × 4 × 4 × ·56		
	Flanged Plate	15 × 4	16 × 4		
46 and under 48	Channel	12 × 4 × 4 × ·56			
	Flanged Plate	16 × 4			

For Footnotes see page 184.

VERTICAL STIFFENING for WATERTIGHT BULKHEADS.

TABLE 10.
(Concluded.)

DEPTH OF BULKHEAD AT MIDDLE LINE FROM UPPER DECK TO TOP OF FLOORS OR DOUBLE BOTTOM.		DEPTH AT CENTRE FROM LOWEST DECK TO TOP OF FLOORS OR INNER BOTTOM PLATING.			
		Feet. 23 and under 24	Feet. 24 and under 25	Feet. 25 and under 26	Feet. 26 and under 27
Feet.		Inches.	Inches.	Inches.	Inches.
22 and under 24	Bulb Angle	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$			
	Channel	$8\frac{1}{2} \times 3 \times 3 \times \cdot 46$			
	Flanged Plate	12×4			
24 and under 26	Bulb Angle		$10 \times 3\frac{1}{2} \times \cdot 54$	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	
	Channel		$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	
	Flanged Plate		13×4	14×4	
26 and under 28	Bulb Angle				$11 \times 3\frac{1}{2} \times \cdot 58$
	Channel				$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$
	Flanged Plate				15×4
28 and under 30	Bulb Angle	$11 \times 3\frac{1}{2} \times \cdot 60$			
	Channel	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$			
	Flanged Plate	15×4			
30 and under 32	Bulb Angle	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$	$12 \times 3\frac{1}{2} \times \cdot 60$	$12 \times 3\frac{1}{2} \times \cdot 64$	
	Channel	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	
	Flanged Plate	15×4	16×4	16×4	
32 and under 34	Bulb Angle	$12 \times 3\frac{1}{2} \times \cdot 60$	$12 \times 3\frac{1}{2} \times \cdot 64$		
	Channel	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$12 \times 4 \times 4 \times \cdot 54$	$12 \times 4 \times 4 \times \cdot 60$
	Flanged Plate	16×4	16×4	16×5	16×5
34 and under 36	Bulb Angle	$12 \times 3\frac{1}{2} \times \cdot 64$			
	Channel	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$12 \times 4 \times 4 \times \cdot 54$	$12 \times 4 \times 4 \times \cdot 60$	$12 \times 4 \times 4 \times \cdot 70$
	Flanged Plate	16×4	16×5	16×5	16×6
36 and under 38	Channel	$12 \times 4 \times 4 \times \cdot 54$	$12 \times 4 \times 4 \times \cdot 60$	$12 \times 4 \times 4 \times \cdot 70$	
	Flanged Plate	16×5	16×5	16×6	
38 and under 40	Channel	$12 \times 4 \times 4 \times \cdot 60$			
	Flanged Plate	16×5			

Bracket plates or other efficient attachments are to be fitted at the heads and heels of all vertical stiffeners, except in the upper 'tween decks. For stiffeners in upper 'tween decks see small Table.✱

Where the stiffeners are stopped at a wood deck the beam spaces adjacent to the bulkhead are to be plated over to form an efficient semi-box beam, to which the brackets on the stiffeners are to be attached.

In Small Vessels where it may be desired to fit stiffeners without brackets, the stiffeners are to be increased in size beyond the dimensions given in the Table.

The stiffeners are to be spaced 30 inches apart, centre to centre, except on the collision bulkhead.

On the Collision Bulkhead the vertical stiffeners are to be spaced 24 inches apart, and horizontal stiffeners of bulb angle, one inch deeper than required for bulb angle frames in peaks, are to be fitted on the opposite side of the bulkhead, spaced 4 feet apart, and attached to the sides of the ship by efficient brackets.

Where flanged plate stiffeners are 12 inches or more in depth, horizontal tie bars with intercostal plates spaced not more than 10 feet apart are to be fitted as shown in sketches on pages 127 and 129. The tie bars to be of the dimensions required for side stringer angles and the intercostal plates of the same thickness as the bulkhead plating.

The Bulkhead Plating is to maintain the thickness required by the Table, at floor or tank top from the bottom of the bulkhead to one-half the height to the lowest laid deck, from whence it may be gradually reduced to the thickness required at upper deck, but in vessels having 'tween decks the thickness of the plating in the upper 'tween decks need not exceed ·26 of an inch, in the second 'tween decks ·30 of an inch, and in the third 'tween decks ·34 of an inch.

✱ VERTICAL STIFFENERS TO WATERTIGHT BULKHEADS IN UPPER 'TWEEN DECKS.

	HEIGHT OF 'TWEEN DECKS.			
	Feet. Under 8	Feet. 8 and under 9	Feet. 9 and under 10	Feet. 10 and under 11
	Inches.	Inches.	Inches.	Inches
ANGLE.	$3\frac{1}{2} \times 3 \times \cdot 30$	$4 \times 3 \times \cdot 34$	$4\frac{1}{2} \times 3 \times \cdot 34$	$5 \times 3 \times \cdot 34$
FLANGED PLATE.	4	5	$5\frac{1}{2}$	$6\frac{1}{2}$

BEAMS fitted TO EVERY FRAME, with a Steel or Iron Deck. TABLE 11.

(See Continuation.)

LENGTH OF BEAM AMIDSHIPS.	UPPER DECK BEAMS IN STEAMERS WHERE ONE TIER OF BEAMS ONLY IS FITTED; FOR SAILING VESSELS, *see* Footnote (*a*). ✻✻ *See also* Sec. 47, Par. 7.				BEAMS AT UPPER DECKS IN STEAMERS WHERE MORE THAN ONE TIER OF BEAMS ARE FITTED, AT AWNING OR SHELTER DECKS AND AT FORECASTLE DECKS, AND BRIDGE DECKS EXCEEDING ONE-TENTH THE VESSEL'S LENGTH AND POOP DECKS COVERING ENGINE AND BOILER OPENINGS ✻✻			
	BEAMS AMIDSHIPS. (*b*) (For Beams at ends *see* Footnote, Table 13.)			Beam Knees fore and aft. *See* also Sec. 20, Pars. 10 & 11.	BEAMS AMIDSHIPS. (*b*) (For Beams at ends *see* Footnote, Table 13.)			Beam Knees fore and aft. *See* Sec. 20, Par. 10.
	1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.		1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.	
Feet.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	ins. ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	ins. ins.
16 and under 18	3½ × 2½ × ·30	3½ × 2½ × ·30	3 × 2½ × ·30	11 × ·30				
18 and under 20	4 × 2½ × ·30	3½ × 2½ × ·30	3 × 2½ × ·30	12 × ·30				
20 and under 22	4 × 3 × ·30	4 × 2½ × ·30	3½ × 2½ × ·30	13 × ·30				
22 and under 24	4½ × 3 × ·30	4 × 3 × ·30	4 × 2½ × ·30	14 × ·30				
24 and under 26	5 × 3 × ·30	4½ × 3 × ·30	4 × 3 × ·30	15 × ·30	4½ × 3 × ·30	4 × 3 × ·30	3½ × 2½ × ·30	11 × ·30
26 and under 28	5 × 3 × ·34	5 × 3 × ·30	4½ × 3 × ·30	16 × ·30	5 × 3 × ·30	4 × 3 × ·30	4 × 2½ × ·30	12 × ·30
28 and under 30	5½ × 3 × ·34	5 × 3 × ·34	5 × 3 × ·30	17 × ·34	5 × 3 × ·34	4½ × 3 × ·30	4 × 2½ × ·30	12 × ·30
	Bulb Angles.							
30 and under 32	5½ × 3 × ·34	5½ × 3 × ·34	5 × 3 × ·34	18 × ·34	5½ × 3 × ·34	5 × 3 × ·30	4 × 2½ × ·30	13 × ·30
		Bulb Angles.						
32 and under 34	6 × 3 × ·36	5½ × 3 × ·34	5½ × 3 × ·34	19 × ·40	5½ × 3 × ·40	5 × 3 × ·34	4 × 3 × ·30	13 × ·34
					Bulb Angles			
34 and under 36	6½ × 3 × ·38	6 × 3 × ·36	5½ × 3 × ·40	20 × ·40	5½ × 3 × ·34	5½ × 3 × ·34	4½ × 3 × ·30	14 × ·34
			Bulb Angles.					
36 and under 38	7 × 3 × ·40	6 × 3 × ·40	5½ × 3 × ·34	21 × ·40	5½ × 3 × ·40	5½ × 3 × ·40	5 × 3 × ·30	15 × ·40
						Bulb Angles.		
38 and under 40	7½ × 3 × ·42	6½ × 3 × ·42	5½ × 3 × ·40	22 × ·42	6½ × 3 × ·40	5½ × 3 × ·34	5½ × 3 × ·30	16 × ·40
40 and under 42	8 × 3 × ·46	7 × 3 × ·42	6 × 3 × ·40	23 × ·46	7 × 3 × ·40	5½ × 3 × ·40	5½ × 3 × ·34	17 × ·40
42 and under 44	8½ × 3 × ·46	7½ × 3 × ·42	6½ × 3 × ·40	24 × ·50	7½ × 3 × ·42	6 × 3 × ·40	5½ × 3 × ·40	18 × ·40
							Bulb Angles.	
44 and under 46		8 × 3 × ·44	7 × 3 × ·40	25 × ·50		6½ × 3 × ·40	5½ × 3 × ·34	19 × ·40
46 and under 48		8½ × 3 × ·46	7 × 3 × ·44	26 × ·50		7 × 3 × ·40	5½ × 3 × ·40	20 × ·40
48 and under 50		8½ × 3 × ·50	7½ × 3 × ·44	27 × ·50		7 × 3 × ·42	6 × 3 × ·40	21 × ·42
50 and under 52			8 × 3 × ·44	28 × ·50		7½ × 3 × ·42	6½ × 3 × ·40	22 × ·42
52 and under 54						8 × 3 × ·42	7 × 3 × ·40	23 × ·42
54 and under 56						8 × 3 × ·46	7 × 3 × ·42	24 × ·46
56 and under 58						8½ × 3 × ·46	7½ × 3 × ·42	25 × ·46
58 and under 60						8½ × 3½ × ·48	8 × 3 × ·42	26 × ·48
60 and under 62							8 × 3 × ·46	27 × ·48
62 and under 64							8½ × 3 × ·46	28 × ·50
64 and under 66							8½ × 3½ × ·48	29 × ·50
66 and under 68							9 × 3½ × ·48	30 × ·50
68 and under 70							9 × 3½ × ·50	31 × ·50
70 and under 72							9½ × 3½ × ·50	32 × ·50
72 and under 74							9½ × 3½ × ·54	33 × ·54
74 and under 76							10 × 3½ × ·54	34 × ·54
76 and under 78							10 × 3½ × ·58	35 × ·58
78 and under 80							10½ × 3½ × ·58	36 × ·58

(*a*) In sailing vessels where the length of the midship beam is less than 30 feet, the upper and lower deck beams are to be ½ inch deeper than given in the Table for upper deck beams of the same length, and where the length is 30 feet and above, the upper, lower and orlop deck beams are to be 1 inch deeper than given in the Table for upper deck beams of the same length.

(*b*) The beams at the ends of hatchways may be of the same size as the remainder of the beams, provided they be supported at the hatch corners by pillars or girders.

✻ ✻ Where the height between decks exceeds 8 feet 6 inches the size of beams is to be increased.

See footnotes on Table 13.

BEAMS fitted TO EVERY FRAME, with a Steel or Iron Deck. TABLE 11.

(Concluded.)

LENGTH OF BEAM AMIDSHIPS.	ALL TIERS OF BEAMS (IN STEAMERS) BELOW UPPER DECKS NOT FITTED EXCLUSIVELY FOR THE ACCOMMODATION OF PASSENGERS. † ** — BEAMS AMIDSHIPS. (*b*) (For Beams at ends *see* Footnote, Table 13.) 1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.	Beam Knees fore and aft. *See* Sec. 20, Par. 10.	BEAMS AT BRIDGE DECKS LESS THAN ONE-TENTH THE VESSEL'S LENGTH, AND POOP DECKS NOT COVERING ENGINE AND BOILER OPENINGS. — 1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.	Beam Knees fore and aft. *See* Sec. 20, Par. 10.
Feet.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	ins. ins.
16 and under 18								
18 and under 20								
20 and under 22								
22 and under 24					3 × 2½ × ·28	3 × 2½ × ·28	3 × 2½ × ·24	8 × ·28
24 and under 26	5½ × 3 × ·30	5 × 3 × ·30	4 × 2½ × ·30	13 × ·30	3½ × 2½ × ·28	3½ × 2½ × ·28	3 × 2½ × ·26	9 × ·28
26 and under 28	5½ × 3 × ·34	5 × 3 × ·30	4 × 2½ × ·30	13 × ·30	3½ × 2½ × ·30	3½ × 2½ × ·30	3 × 2½ × ·28	9 × ·30
28 and under 30	5½ × 3 × ·40	5 × 3 × ·34	4 × 3 × ·30	13 × ·34	4 × 2½ × ·30	3½ × 2½ × ·30	3 × 2½ × ·30	10 × ·30
30 and under 32	Bulb Angles. 5½ × 3 × ·34	5½ × 3 × ·34	4½ × 3 × ·30	14 × ·34	4 × 3 × ·30	4 × 2½ × ·30	3½ × 2½ × ·30	11 × ·30
32 and under 34	5½ × 3 × ·36	5½ × 3 × ·40	5 × 3 × ·30	15 × ·40	4½ × 3 × ·30	4 × 3 × ·30	3½ × 2½ × ·30	11 × ·30
34 and under 36	6 × 3 × ·36	Bulb Angles. 5½ × 3 × ·34	5½ × 3 × ·30	16 × ·40	5 × 3 × ·30	4 × 3 × ·30	4 × 2½ × ·30	12 × ·30
36 and under 38	6½ × 3 × ·38	5½ × 3 × ·40	5½ × 3 × ·34	17 × ·40	5 × 3 × ·34	4½ × 3 × ·30	4 × 2½ × ·30	12 × ·30
38 and under 40	7 × 3 × ·40	6 × 3 × ·40	5½ × 3 × ·40	18 × ·40	5½ × 3 × ·34	5 × 3 × ·34	4 × 3 × ·30	13 × ·34
40 and under 42	7½ × 3 × ·42	6½ × 3 × ·40	Bulb Angles. 5½ × 3 × ·34	19 × ·40	Bulb Angles. 5½ × 3 × ·34	5½ × 3 × ·34	4½ × 3 × ·30	14 × ·34
42 and under 44	8 × 3 × ·44	7 × 3 × ·40	5½ × 3 × ·40	20 × ·40	5½ × 3 × ·40	5½ × 3 × ·40	5 × 3 × ·30	15 × ·40
44 and under 46		7 × 3 × ·42	6 × 3 × ·40	21 × ·42		Bulb Angles. 5½ × 3 × ·34	5½ × 3 × ·30	16 × ·40
46 and under 48		7½ × 3 × ·42	6½ × 3 × ·40	22 × ·42		5½ × 3 × ·40	5½ × 3 × ·34	17 × ·40
48 and under 50		8 × 3 × ·42	7 × 3 × ·40	23 × ·42		6 × 3 × ·40	5½ × 3 × ·40	18 × ·40
50 and under 52		8 × 3 × ·46	7 × 3 × ·42	24 × ·46		6½ × 3 × ·40	Bulb Angles. 5½ × 3 × ·34	19 × ·40
52 and under 54		8½ × 3 × ·46	7½ × 3 × ·42	25 × ·46		7 × 3 × ·40	5½ × 3 × ·40	20 × ·40
54 and under 56		8½ × 3½ × ·48	8 × 3 × ·42	26 × ·48		7 × 3 × ·42	6 × 3 × ·40	21 × ·42
56 and under 58		9 × 3½ × ·48	8 × 3 × ·46	27 × ·48		7½ × 3 × ·42	6½ × 3 × ·40	22 × ·42
58 and under 60		9 × 3½ × ·50	8½ × 3 × ·46	28 × ·50		8 × 3 × ·42	7 × 3 × ·40	23 × ·42
60 and under 62			8½ × 3½ × ·48	29 × ·50			7 × 3 × ·42	24 × ·46
62 and under 64			9 × 3½ × ·48	30 × ·50			7½ × 3 × ·42	25 × ·46
64 and under 66			9 × 3½ × ·50	31 × ·50			8 × 3 × ·42	26 × ·48
66 and under 68			9½ × 3½ × ·50	32 × ·50			8 × 3 × ·46	27 × ·48
68 and under 70			9½ × 3½ × ·54	33 × ·54			8½ × 3 × ·46	28 × ·50
70 and under 72			10 × 3½ × ·54	34 × ·54			8½ × 3½ × ·48	29 × ·50
72 and under 74			10 × 3½ × ·58	35 × ·58			9 × 3½ × ·48	30 × ·50
74 and under 76			10½ × 3½ × ·58	36 × ·58			9 × 3½ × ·50	31 × ·50
76 and under 78			10½ × 3½ × ·62	37 × ·62			9½ × 3½ × ·50	32 × ·50
78 and under 80			11 × 3½ × ·62	38 × ·62			9½ × 3½ × ·54	33 × ·54

(*b*) The beams at the ends of hatchways may be of the same size as the remainder of the beams, provided they be supported at the hatch corners by pillars or girders.

† The beams of decks fitted exclusively for the accommodation of passengers and of all tiers in peaks may be of the size given for upper deck beams where more than one tier of beams are fitted.

Beams at the ends of decks below the upper deck less than two-fifths the length of the midship beam may be of the size given for upper deck beams at the ends of the vessel.

** Where the height between decks exceeds 8 feet 6 inches the size of beams is to be increased.

See footnotes on Table 13.

BEAMS fitted TO ALTERNATE FRAMES where no steel or iron deck is fitted. TABLE 12.

(See Continuation.)

LENGTH OF BEAM AMIDSHIPS.	UPPER DECK BEAMS IN STEAMERS WHERE ONE TIER OF BEAMS ONLY IS FITTED; FOR SAILING VESSELS, *see* Footnote (*a*)✻✻ *See also* Sec. 47, Par. 7.				BEAMS at UPPER DECKS IN STEAMERS WHERE MORE THAN ONE TIER OF BEAMS ARE FITTED, at AWNING OR SHELTER DECKS AND at FORECASTLE DECKS and BRIDGE DECKS EXCEEDING ONE-TENTH THE VESSEL'S LENGTH AND POOP DECKS COVERING ENGINE and BOILER OPENINGS. ✻✻			
	BEAMS AMIDSHIPS. (*b*) (For Beams at ends, *see* Footnote, Table 13.)			Beam Knees fore and aft. *See* Sec. 20. Par. 10.	BEAMS AMIDSHIPS. (*b*) (For Beams at ends, *see* Footnote, Table 13.)			Beam Knees fore and aft. *See* Sec. 20. Par. 10.
	1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.		1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.	
Feet.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	ins. ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	Angles. ins. ins. ins.	ins. ins.
16 and under 18	4½ × 3 × ·34	4½ × 3 × ·30	4 × 3 × ·30	12 × ·30				
18 and under 20	5 × 3 × ·34	5 × 3 × ·34	4½ × 3 × ·34	13 × ·30				
20 and under 22	5½ × 3 × ·40	5½ × 3 × ·40	5 × 3 × ·40	15 × ·30	5½ × 3 × ·34	5 × 3 × ·34	4½ × 3 × ·34	14 × ·30
22 and under 24	5½ × 3½ × ·44	5½ × 3½ × ·40	5½ × 3 × ·40	16 × ·30	5½ × 3½ × ·40	5½ × 3 × ·34	4½ × 3 × ·34	14 × ·30
24 and under 26	Bulb Plate. 6 × ·30	6 × 3½ × ·44	5½ × 3½ × ·44	18 × ·30	Bulb Plate. 6 × ·26	5½ × 3½ × ·40	5 × 3 × ·34	15 × ·30
26 and under 28	6 × ·34	Bulb Plate. 6 × ·26	6½ × 3½ × ·44	19 × ·34	6 × ·30	5½ × 3½ × ·44	5½ × 3 × ·34	15 × ·30
28 and under 30	7 × ·34	6 × ·30	Bulb Plate. 6 × ·26	21 × ·34	6 × ·34	Bulb Plate. 6 × ·26	5½ × 3 × ·40	16 × ·34
30 and under 32	7 × ·40	7 × ·30	6 × ·30	22 × ·40	7 × ·30	6 × ·30	5½ × 3½ × ·44	17 × ·34
32 and under 34	8 × ·40	7 × ·34	6 × ·34	24 × ·40	7 × ·34	6 × ·34	6½ × 3½ × ·44	18 × ·34
34 and under 36	8 × ·44	7 × ·40	7 × ·30	25 × ·44	7 × ·40	7 × ·30	Bulb Plate. 6 × ·26	19 × ·40
36 and under 38	9 × ·44	8 × ·40	7 × ·34	27 × ·44	8 × ·40	7 × ·34	6 × ·30	20 × ·40
38 and under 40	9 × ·50	8 × ·44	7 × ·40	28 × ·50	8 × ·44	7 × ·40	6 × ·34	21 × ·44
40 and under 42	10 × ·50	9 × ·44	8 × ·40	30 × ·50	9 × ·44	8 × ·40	7 × ·30	22 × ·44
42 and under 44	10 × ·54	9 × ·50	8 × ·44	31 × ·54	10 × ·44	8 × ·44	7 × ·34	23 × ·50
44 and under 46		10 × ·44	9 × ·44	33 × ·54		9 × ·40	7 × ·40	24 × ·50
46 and under 48		10 × ·50	9 × ·50	34 × ·54		9 × ·44	8 × ·40	25 × ·54
48 and under 50		10 × ·54	10 × ·44	36 × ·54		10 × ·44	8 × ·44	26 × ·54
50 and under 52			10 × ·50	37 × ·54		10 × ·50	9 × ·40	27 × ·54
52 and under 54						10 × ·54	9 × ·44	28 × ·54
54 and under 56						11 × ·50	9 × ·50	29 × ·54
56 and under 58							10 × ·44	30 × ·54
58 and under 60							10 × ·50	31 × ·54
60 and under 62							10 × ·54	32 × ·54
62 and under 64							11 × ·50	33 × ·54
64 and under 66							11 × ·54	34 × ·54

(*a*) In sailing vessels where the length of the midship beam is less than 30 feet, the upper and lower deck beams are to be ½ inch deeper than given in the Table for upper deck beams of the same length; and where the length is 30 feet and above, the upper, lower, and orlop deck beams are to be 1 inch deeper than given in the Tables for upper deck beams of the same length.

(*b*) Single angles fitted to hatch end beams are to be equivalent to the double angles required by the Rules.

✻✻ Where the height between decks exceeds 8 feet 6 inches, the size of beams is to be increased.

See footnotes on Table 13.

BEAMS fitted TO ALTERNATE FRAMES where no steel or iron deck is fitted.

LENGTH OF BEAM AMIDSHIPS.	ALL TIERS OF BEAMS (IN STEAMERS) BELOW UPPER DECKS NOT FITTED EXCLUSIVELY FOR THE ACCOMMODATION OF PASSENGERS.†**				BEAMS at BRIDGE DECKS LESS THAN ONE TENTH THE VESSEL'S LENGTH, and POOP DECKS NOT COVERING ENGINE and BOILER OPENINGS.				"STRONG" HOLD BEAMS (c)		
	BEAMS AMIDSHIPS. (b) (For Beams at ends *see* Footnote, Table 13.)			Beam Knees fore and aft *See* Sec. 20. Par. 10.				Beam Knees fore and aft. *See* Sec. 20. Par. 10.	Plate.	Double Angles on top and bottom edges.	Beam Knees fore and aft. *See* Sec. 20. Par. 10.
	1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.		1 With one row of Pillars.	2 With two rows of Pillars.	3 With three rows of Pillars.				
			Angles.		Angles.	Angles.	Angles.				
Feet.	ins. ins.	ins. ins.	ins. ins. ins.	ins. ins.	ins. ins. ins.	ins. ins. ins.	ins. ins. ins.	ins. ins.	ins. ins.	ins. ins. ins.	ins. ins.
16 and under 18											
18 and under 20											
20 and under 22											
22 and under 24					4½ × 3 × ·30	4½ × 3 × ·30	4 × 3 × ·30	11 × ·30			
24 and under 26	Bulb Plate. 7 × ·30	Bulb Plate. 6 × ·30	5½ × 3½ × ·44	17 × ·34	4½ × 3 × ·34	4½ × 3 × ·34	4 × 3 × ·34	11 × ·30	7 × ·34	3 × 3 × ·30	21 × ·40
26 and under 28	7 × ·34	6 × ·34	6½ × 3½ × ·44	18 × ·34	5 × 3 × ·34	4½ × 3 × ·34	4 × 3 × ·34	12 × ·30	7½ × ·34	3 × 3 × ·34	22 × ·44
28 and under 30	7 × ·40	7 × ·30	Bulb Plate. 6 × ·26	19 × ·40	5½ × 3 × ·34	5 × 3 × ·34	4½ × 3 × ·34	12 × ·30	8 × ·40	3½ × 3 × ·34	23 × ·44
30 and under 32	8 × ·40	7 × ·34	6 × ·30	20 × ·40	5½ × 3 × ·40	5½ × 3 × ·34	4½ × 3 × ·34	13 × ·30	8½ × ·40	4 × 3 × ·34	24 × ·44
32 and under 34	8 × ·44	7 × ·40	6 × ·34	21 × ·44	5½ × 3½ × ·44	5½ × 3 × ·40	5 × 3 × ·34	14 × ·30	9 × ·44	4 × 4 × ·34	25 × ·50
34 and under 36	9 × ·44	8 × ·40	7 × ·30	22 × ·44	Bulb Plate. 6 × ·30	5½ × 3½ × ·44	5½ × 3 × ·34	15 × ·30	9½ × ·44	4 × 4 × ·40	26 × ·50
36 and under 38	10 × ·44	8 × ·44	7 × ·34	23 × ·50	6 × ·34	Bulb Plate. 6 × ·26	5½ × 3 × ·40	16 × ·34	10 × ·50	4 × 4 × ·44	27 × ·50
38 and under 40	10 × ·50	9 × ·40	7 × ·40	24 × ·50	7 × ·34	6 × ·34	5½ × 3½ × ·44	18 × ·34	10 × ·54	4 × 4 × ·44	28 × ·54
40 and under 42	10 × ·54	9 × ·44	8 × ·40	25 × ·54	7 × ·40	7 × ·30	Bulb Plate. 6 × ·26	19 × ·40	11 × ·54	4 × 4 × ·44	29 × ·54
42 and under 44	11 × ·54	10 × ·44	8 × ·44	26 × ·54	8 × ·40	7 × ·34	6 × ·30	20 × ·40	11½ × ·54	5 × 4 × ·44	30 × ·54
44 and under 46		10 × ·50	9 × ·40	27 × ·54		7 × ·40	6 × ·34	21 × ·40	12 × ·54	5 × 4 × ·44	31 × ·54
46 and under 48		10 × ·54	9 × ·44	28 × ·54		8 × ·40	7 × ·30	22 × ·44	12 × ·60	5 × 4 × ·44	32 × ·60
48 and under 50		11 × ·50	9 × ·50	29 × ·54		8 × ·44	7 × ·34	23 × ·44	12 × ·60	6 × 4 × ·50	33 × ·60
50 and under 52		11 × ·54	10 × ·44	30 × ·54		9 × ·40	7 × ·40	24 × ·50	13 × ·60	6 × 4 × ·50	34 × ·60
52 and under 54		12 × ·50	10 × ·50	31 × ·54		9 × ·44	8 × ·40	25 × ·54	13 × ·60	6½ × 4 × ·50	35 × ·60
54 and under 56		12 × ·54	10 × ·54	32 × ·54		9 × ·50	8 × ·44	26 × ·54	13 × ·60	6½ × 4½ × ·50	36 × ·60
56 and under 58			11 × ·50	33 × ·54			9 × ·40	27 × ·54	13 × ·60	6½ × 4½ × ·54	37 × ·60
58 and under 60			11 × ·54	34 × ·54			9 × ·44	28 × ·54	14 × ·60	6½ × 4½ × ·54	38 × ·60
60 and under 62			12 × ·50	35 × ·54			9 × ·50	29 × ·54	14 × ·60	6½ × 4½ × ·54	39 × ·60
62 and under 64			12 × ·54	36 × ·54			10 × ·44	30 × ·54	14 × ·64	6½ × 4½ × ·60	40 × ·64
64 and under 66			12 × ·60	37 × ·60			10 × ·50	31 × ·54	15 × ·64	6½ × 4½ × ·60	42 × ·64

† The beams of decks fitted exclusively for the accommodation of passengers and of all tiers in peaks may be of the size given for upper deck beams where more than one tier of beams are fitted.

Beams at the ends of decks below the upper deck, less than two-fifths the length of the midship beam, may be of the size given for upper deck beams at the ends of the vessel.

** Where the height between decks exceeds 8 feet 6 inches the size of beams is to be increased.

(b) Single angles fitted to hatch end beams are to be equivalent to the double angles required by the Rules.

(c) These beams are to be formed of a plate with double angle bars on the upper and lower edges. The beam plates and angle bars are to be of the sizes given above, and the broad flanges of the angle bars are to be fitted horizontally. Semi-box beams may be adopted in lieu thereof, formed of bulb plate and single angle bars of the sizes given for upper deck beams, kneed to two consecutive frames with a covering plate of the thickness of the angles.

Strong beams in the machinery space are to have double angles on their upper and lower edges, unless cross tie plating is fitted on them, in which case only single angles need be fitted to the upper and lower edges.

See Footnotes on Table 13.

WIDELY SPACED PILLARS.

TABLE **15.**

(For 26 feet and above, see continuation.)

NUMBERS.* $\frac{S \times B \times H}{100}$	LENGTH AND FORM OF PILLAR. 22 feet and under 24 feet. TUBULAR. Outside diameter.	DOUBLE CHANNELS AND FACE PLATES. Channels.	Plates.	FOUR ANGLES.	24 feet and under 26 feet. TUBULAR. Outside diameter.	DOUBLE CHANNELS AND FACE PLATES. Channels.	Plates.	FOUR ANGLES.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
11 and under 13	9×·40	9 ×4 ×4 ×·62		5×5×·44	9×·44	9 ×4 ×4 ×·66		5×5×·50
13 and under 16	9×·44	9 ×4 ×4 ×·66		5×5×·44	10×·40	8½×3½×3½×·44	9 ×·40	5×5×·50
16 and under 19	10×·40	8½×3½×3½×·44	9×·40	5×5×·50	10×·44	9 ×3½×3½×·46	10×·40	5×5×·54
19 and under 22	10×·40	8½×3½×3½×·44	10×·40	5×5×·50	10×·44	9 ×3½×3½×·46	10×·40	5×5×·54
22 and under 25	10×·44	8½×3½×3½×·46	10×·40	5×5× 54	10×·50	9 ×3½×3½×·46	10×·40	5×5×·60
25 and under 29	10×·50	9 ×3½×3½×·46	10×·40	5×5×·60	10×·50	9½×3½×3½×·48	10×·42	6×6×·50
29 and under 33	11×·50	9½×3½×3½×·48	10×·42	6×6×·50	11×·50	10 ×3½×3½×·48	11×·42	6×6×·54
33 and under 37	12×·50	10½×3½×3½×·48	11×·42	6×6×·54	12×·50	11 ×3½×3½×·48	11×·46	6×6×·60
37 and under 42	12×·54	11 ×3½×3½×·48	11×·46	6×6×·60	12×·54	11 ×3½×3½×·48	11×·50	6×6×·60
42 and under 47	13×·54	11 ×3½×3½×·48	12×·50	6×6×·64	13×·54	11 ×3½×3½×·48	12×·50	6×6×·64
47 and under 52	13×·60	11 ×3½×3½×·50	12×·56	6×6×·70	13×·60	11 ×3½×3½×·50	12×·56	6×6×·70
52 and under 58	14×·60	11 ×3½×3½×·50	12×·60	7×7×·60	14×·60	11 ×3½×3½×·50	12×·60	7×7×·60
58 and under 64	15×·60	11½×3½×3½×·50	13×·60	7×7×·64	15×·60	11½×3½×3½×·50	13×·60	7×7×·64
64 and under 71	16×·60	12 ×3½×3½×·50	13×·70	7×7×·70	16×·60	12 ×3½×3½×·50	13×·70	7×7×·70
71 and under 78	17×·60	12 ×3½×3½×·50	13×·74	7×7×·74	17×·60	12 ×3½×3½×·50	13×·74	7×7×·74
78 and under 86	18×·60	12 ×4 ×4 ×·60	13×·74	7×7×·80	18×·60	12 ×4 ×4 ×·60	13×·74	7×7×·80
86 and under 94	18×·64	12 ×4 ×4 ×·70	13×·74	7×7×·84	18×·64	12 ×4 ×4 ×·70	13×·74	7×7×·84
94 and under 102	18×·70	12 ×4 ×4 ×·72	14×·80	8×8×·80	18×·70	12 ×4 ×4 ×·72	14×·80	8×8×·80
102 and under 110	18×·74			8×8×·84				
110 and under 118								
118 and under 126								
126 and under 134								

1. * S is the fore and aft distance in feet from centre of span to centre of span.

   B is one-third the breadth of vessel in feet at the deck at the head of the pillars, where two rows of pillars are fitted, and one-fourth the breadth where three rows are fitted.

   H is the sum of the heights of the several 'tween decks in feet from top of beam to top of beam above the pillars with an addition of 5 feet for the upper, awning or shelter deck, bridge, poop or forecastle deck.

   In the case of a deck fitted exclusively for the accommodation of passengers, the height of 'tween decks may be taken as being 5 feet.

2. For methods of obtaining the numbers regulating the size of the pillars, *see* Sketches on pages 134 to 137.

3. The rivets in the angles or channels forming pillars are to be spaced not more than 7 diameters apart centre to centre, and when the flanges are inches in width or above, zigzag riveting is to be adopted.

4. The rivets in the seams of built tubular pillars are to be spaced not more than 5 diameters apart.

5. Pillars of other form will be admitted provided they are of equivalent strength to those given in the Table.

6. Where no seating is fitted, widely spaced hold pillars are to be steppped where practicable at an intersection of floors and intercostals; but in cases where this cannot be done, intercostal brackets are to be fitted on each side of the floors beneath the pillars.

7. For some methods of attaching the pillars at heads and heels *see* Sketches on pages 132 and 133.

WIDELY SPACED PILLARS.

TABLE 15.
(Concluded.)

NUMBERS.* $\frac{S \times B \times H}{100}$	LENGTH AND FORM OF PILLAR.							
	26 feet and under 28 feet.				28 feet and under 30 feet.			
	TUBULAR.	DOUBLE CHANNELS AND FACE PLATES.		FOUR ANGLES.	TUBULAR.	DOUBLE CHANNELS AND FACE PLATES.		FOUR ANGLES.
	Outside diameter.	Channels.	Plates.		Outside diameter.	Channels	Plates.	
	inches.	inches	inches.	inches.	inches.	inches.	inches.	inches.
11 and under 13	10 × ·44	9 × 3½ × 3½ × ·46	10 × ·40	5 × 5 × ·54	10 × ·50	9½ × 3½ × 3½ × ·48	10 × ·42	6 × 6 × ·50
13 and under 16	10 × ·44	9 × 3½ × 3½ × ·46	10 × ·40	5 × 5 × ·54	10 × ·50	9½ × 3½ × 3½ × ·48	11 × ·40	6 × 6 × ·50
16 and under 19	10 × ·50	9 × 3½ × 3½ × ·46	10 × ·40	5 × 5 × ·60	11 × ·44	10 × 3½ × 3½ × ·48	11 × ·42	6 × 6 × ·54
19 and under 22	10 × ·50	9½ × 3½ × 3½ × ·48	11 × ·40	6 × 6 × ·50	11 × ·44	10½ × 3½ × 3½ × ·48	11 × ·42	6 × 6 × ·54
22 and under 25	11 × ·44	10 × 3½ × 3½ × ·48	11 × ·42	6 × 6 × ·54	11 × ·50	11 × 3½ × 3½ × ·48	11 × ·46	6 × 6 × ·60
25 and under 29	11 × ·50	10½ × 3½ × 3½ × ·48	11 × ·46	6 × 6 × ·54	11 × ·50	11 × 3½ × 3½ × ·48	11 × ·46	6 × 6 × ·60
29 and under 33	12 × ·50	11 × 3½ × 3½ × ·48	11 × ·46	6 × 6 × ·60	12 × ·50	11 × 3½ × 3½ × ·48	12 × ·50	6 × 6 × ·64
33 and under 37	12 × ·50	11 × 3½ × 3½ × ·48	11 × ·46	6 × 6 × ·60	12 × ·54	11 × 3½ × 3½ × ·48	12 × ·50	6 × 6 × ·64
37 and under 42	12 × ·54	11 × 3½ × 3½ × ·48	12 × ·50	6 × 6 × ·64	13 × ·54	11 × 3½ × 3½ × ·48	12 × ·56	6 × 6 × ·70
42 and under 47	13 × ·54	11 × 3½ × 3½ × ·48	12 × ·56	6 × 6 × ·70	13 × ·60	11 × 3½ × 3½ × ·50	12 × ·60	7 × 7 × ·60
47 and under 52	13 × ·60	11 × 3½ × 3½ × ·50	12 × ·60	7 × 7 × ·60	14 × ·60	11½ × 3½ × 3½ × ·50	13 × ·60	7 × 7 × ·64
52 and under 58	14 × ·60	11½ × 3½ × 3½ × ·50	12 × ·70	7 × 7 × ·64	15 × ·60	12 × 3½ × 3½ × ·50	13 × ·70	7 × 7 × ·70
58 and under 64	15 × ·60	12 × 3½ × 3½ × ·50	13 × ·70	7 × 7 × ·70	16 × ·60	12 × 3½ × 3½ × ·50	13 × ·74	7 × 7 × ·74
64 and under 71	16 × ·60	12 × 3½ × 3½ × ·50	13 × ·74	7 × 7 × ·74	17 × ·60	12 × 4 × 4 × ·60	13 × ·74	7 × 7 × ·80
71 and under 78	17 × ·60	12 × 4 × 4 × ·60	13 × ·74	7 × 7 × ·80	18 × ·60	12 × 4 × 4 × ·70	13 × ·74	8 × 8 × ·74
78 and under 86	18 × ·60							
86 and under 94								
94 and under 102								
102 and under 110								
110 and under 118								
118 and under 126								
126 and under 134								

1.* S is the fore and aft distance in feet from centre of span to centre of span.

B is one-third the breadth of vessel in feet at the deck at the head of the pillars, where two rows of pillars are fitted, and one-fourth the breadth where three rows are fitted.

H is the sum of the heights of the several 'tween decks in feet from top of beam to top of beam above the pillars with an addition of 5 feet for the upper, awning or shelter deck, bridge, poop or forecastle deck.

In the case of a deck fitted exclusively for the accommodation of passengers, the height of 'tween decks may be taken as being 5 feet.

2. For methods of obtaining the numbers regulating the size of the pillars, *see* Sketches on pages 134 to 137.

3. The rivets in the angles or channels forming pillars are to be spaced not more than 7 diameters apart centre to centre, and when the flanges are 5 inches in width or above, zigzag riveting is to be adopted.

4. The rivets in the seams of built tubular pillars are to be spaced not more than 5 diameters apart.

5. Pillars of other form will be admitted provided they are of equivalent strength to those given in the Table.

6. Where no seating is fitted, widely spaced hold pillars are to be stepped where practicable at an intersection of floors and intercostals; but in cases where this cannot be done, intercostal brackets are to be fitted on each side of the floors beneath the pillars.

7. For some methods of attaching the pillars at heads and heels, *see* Sketches on pages 132 and 133.

GIRDERS AT HEADS OF WIDELY SPACED PILLARS.

TABLE **16.**

(See Continuation.)

NUMBERS.* $\frac{S^2 \times B \times H}{100}$	Thickness of Intercostal Plate and Angle.	DEPTH OF BEAMS. 5 inches. SIZE OF GIRDERS. Double Channels.	Double Angles.	6 inches. Double Channels.	Double Angles.
		inches.	inches.	inches.	inches.
150 and under 180	·34		6 × 4 × ·44		6 × 4 × ·40
180 and under 210	·34		6 × 4 × ·50		6 × 4 × ·44
210 and under 250	·34	7 × 3 × 3 × ·38	6 × 4 × ·54		6 × 4 × ·50
250 and under 290	·40	7 × 3½ × 3½ × ·40	6 × 4 × ·64	7 × 3 × 3 × ·38	6 × 4 × ·54
290 and under 330	·40	7½ × 3½ × 3½ × ·42	6½ × 4½ × ·60	7 × 3½ × 3½ × ·40	6 × 4 × ·64
330 and under 380	·40	8 × 3½ × 3½ × ·46	6½ × 4½ × ·64	7½ × 3½ × 3½ × ·42	6½ × 4½ × ·60
380 and under 430	·40	9 × 3½ × 3½ × ·46	6 × 6 × ·64	8 × 3½ × 3½ × ·46	6½ × 4½ × ·64
430 and under 480	·44	9 × 3½ × 3½ × ·60	6 × 6 × ·74	9 × 3½ × 3½ × ·46	6 × 6 × ·64
480 and under 540	·44	10 × 3½ × 3½ × ·60	7 × 7 × ·70	9 × 3½ × 3½ × ·60	6 × 6 × ·74
540 and under 600	·44	11 × 3½ × 3½ × ·60	7 × 7 × ·80	10 × 3½ × 3½ × ·60	7 × 7 × ·70
600 and under 670	·44			11 × 3½ × 3½ × ·60	7 × 7 × ·80
670 and under 740	·44			12 × 3½ × 3½ × ·60	
740 and under 820	·50				
820 and under 900	·50				
900 and under 990	·50				
990 and under 1090	·50				
1090 and under 1200	·50				
1200 and under 1320	·50				
1320 and under 1450	·50				
1450 and under 1590	·54				
1590 and under 1740	·54				
1740 and under 1900	·54				
1900 and under 2070	·54				

1.* S is the fore and aft spacing of the pillars in feet from centre to centre.

B is one-third the breadth of vessel in feet at the deck when two rows of pillars are fitted, and one-fourth the breadth when three rows are fitted.

H is the height of the 'tween decks next above the girder, measured in feet from top of beam to top of beam, where the pillars in the 'tween decks are spaced the same as those below. In the case of decks fitted exclusively for the accommodation of passengers, and for upper, awning or shelter, bridge, poop or forecastle deck, H is to be taken as 5 feet.

Where the pillars above a deck are not placed over those below, H is to be the sum of the heights of the several 'tween decks in feet above the girder, with the addition of 5 feet for upper, awning or shelter deck, bridge, poop or forecastle deck.

2. For methods of obtaining the numbers regulating the scantlings for girders, *see* Sketches on pages 138 to 141.

3. The girders are to consist of double channels or double angles, intercostal plate and rider plate, of the scantlings given in the Table. (*See* Sketches on pages 132 and 133.)

4. The intercostal plates and channels or angles are to be fitted in long lengths and efficiently strapped or lapped at the butts to the Surveyor's satisfaction.

5. The channels are to be attached by two rivets to the lower flanges of the beams, or, in the case of angle or bulb angle beams to short angle lugs fitted to the beams, and where double angles are fitted in lieu of channels the intercostal plates are to be attached to the beams by angle lugs extending to the bottom of the girder and beams alternately where beams are fitted at every frame and to the bottom of the girder at every beam where beams are fitted at alternate frames. (*See* Sketch on page 133.)

6. The girders are to be efficiently bracketed to the bulkheads with plates three times the depth of the channels forming girders, measured from the upper edges of the channels and of the same thickness as the channels. The angle attaching the intercostal plate to the deck plating and intercostal plates to beams is to be of the same thickness as the plate, this angle is to be 3 ins. × 3 ins. where the rivets in the intercostal plates are required to be ¾ in. in diameter, and 3½ ins. × 3½ ins. where they are ⅞ in. in diameter. The channels and double angles to be zigzag riveted and the rivets spaced not more than 7 diameters apart, and those in the flanges of the intercostal angle not more than 5 diameters apart, centre to centre.

7. Girders of other form will be admitted provided they are of equivalent strength to those given in the Table.

GIRDERS AT HEADS OF WIDELY SPACED PILLARS.

TABLE 16.

(See Continuation.)

NUMBERS.✻ $\frac{S^2 \times B \times H}{100}$	Thickness of Intercostal Plate and Angle.	DEPTH OF BEAMS. 7 inches. SIZE OF GIRDERS. Double Channels. inches.	Rider Plate. inches.	Double Angles. inches.	8 inches. Double Channels. inches.	Rider Plate. inches.	Double Angles. inches.
150 and under 180	·34						
180 and under 210	·34			6 × 4 × ·40			
210 and under 250	·34			6 × 4 × ·44			6 × 4 × ·40
250 and under 290	·40			6 × 4 × ·50			6 × 4 × ·44
290 and under 330	·40	7 × 3 × 3 × ·38		6 × 4 × ·54			6 × 4 × ·50
330 and under 380	·40	7 × 3½ × 3½ × ·40		6 × 4 × ·64	7 × 3 × 3 × ·38		6 × 4 × ·54
380 and under 430	·40	7½ × 3½ × 3½ × ·42		6½ × 4½ × ·60	7 × 3½ × 3½ × ·40		6 × 4 × ·64
430 and under 480	·44	8 × 3½ × 3½ × ·46		6½ × 4½ × ·64	7½ × 3½ × 3½ × ·42		6½ × 4½ × ·60
480 and under 540	·44	9 × 3½ × 3½ × ·46		6 × 6 × ·64	8 × 3½ × 3½ × ·46		6½ × 4½ × ·64
540 and under 600	·44	9 × 3½ × 3½ × ·60		6 × 6 × ·74	9 × 3½ × 3½ × ·46		6 × 6 × ·64
600 and under 670	·44	10 × 3½ × 3½ × ·60		7 × 7 × ·70	9 × 3½ × 3½ × ·60		6 × 6 × ·74
670 and under 740	·44	11 × 3½ × 3½ × ·60		7 × 7 × ·80	10 × 3½ × 3½ × ·60		7 × 7 × ·70
740 and under 820	·50	12 × 3½ × 3½ × ·60			11 × 3½ × 3½ × ·60		7 × 7 × ·80
820 and under 900	·50	12 × 4 × 4 × ·64			12 × 3½ × 3½ × ·60		
900 and under 990	·50	12 × 3½ × 3½ × ·60	8 × ·60		12 × 4 × 4 × ·64		
990 and under 1090	·50	12 × 3½ × 3½ × ·70	8 × ·70		12 × 3½ × 3½ × ·60	8 × ·60	
1090 and under 1200	·50				12 × 3½ × 3½ × ·70	8 × ·70	
1200 and under 1320	·50				12 × 4 × 4 × ·70	9 × ·70	
1320 and under 1450	·50				12 × 4 × 4 × ·72	10 × ·74	
1450 and under 1590	·54						
1590 and under 1740	·54						
1740 and under 1900	·54						
1900 and under 2070	·54						

1.✻ S is the fore and aft spacing of the pillars in feet from centre to centre.
B is one-third the breadth of vessel in feet at the deck when two rows of pillars are fitted, and one-fourth the breadth when three rows are fitted.
H is the height of the 'tween decks next above the girder, measured in feet from top of beam to top of beam, where the pillars in the 'tween decks are spaced the same as those below In the case of decks fitted exclusively for the accommodation of passengers, and for upper, awning or shelter, bridge, poop or forecastle deck, H is to be taken as 5 feet.

Where the pillars above a deck are not placed over those below, H is to be the sum of the heights of the several 'tween decks in feet above the girder, with the addition of 5 feet for upper, awning or shelter deck, bridge, poop or forecastle deck.

2. For methods of obtaining the numbers regulating the scantlings for girders, *see* Sketches on pages 138 to 141.

3. The girders are to consist of double channels or double angles, intercostal plate and rider plate, of the scantlings given in the Table. (*See* Sketches on pages 132 and 133.)

4. The intercostal plates and channels or angles are to be fitted in long lengths and efficiently strapped or lapped at the butts to the Surveyor's satisfaction.

5. The channels are to be attached by two rivets to the lower flanges of the beams, or in the case of angle or bulb angle beams to short angle lugs fitted to the beams, and where double angles are fitted in lieu of channels the intercostal plates are to be attached to the beams by angle lugs extending to the bottom of the girder and beams alternately where beams are fitted at every frame and to the bottom of the girder at every beam where beams are fitted at alternate frames. (*See* Sketch on page 133.)

6. The girders are to be efficiently bracketed to the bulkheads with plates three times the depth of the channels forming girders, measured from the upper edges of the channels and of the same thickness as the channels. The angle attaching the intercostal plate to the deck plating and intercostal plates to beams is to be of the same thickness as the plate, this angle is to be 3 ins. × 3 ins. where the rivets in the intercostal plates are required to be ¾ in. in diameter, and 3½ ins. × 3½ ins. where they are ⅞ in diameter. The channels and double angles to be zigzag riveted and the rivets spaced not more than 7 diameters apart, and those in the flanges of the intercostal angle not more than 5 diameters apart, centre to centre.

7. Girders of other form will be admitted provided they are of equivalent strength to those given in the Table.

GIRDERS AT HEADS OF WIDELY SPACED PILLARS. TABLE 16.

(See Continuation.)

NUMBERS.* $\frac{S^2 \times B \times H}{100}$	Thickness of Intercostal Plate and Angle.	DEPTH OF BEAMS. 9 inches. SIZE OF GIRDERS. Double Channels. inches.	Rider Plate. inches.	Double Angles. inches.	10 inches. Double Channels. inches.	Rider Plate. inches.	Double Angles. inches.
150 and under 180	·34						
180 and under 210	·34						
210 and under 250	·34						
250 and under 290	·40			6 ×4 ×·40			
290 and under 330	·40			6 ×4 ×·44			6 ×4 ×·40
330 and under 380	·40			6 ×4 ×·50			6 ×4 ×·44
380 and under 430	·40	7 ×3 ×3 ×·38		6 ×4 ×·54			6 ×4 ×·50
430 and under 480	·44	7 ×3½×3½×·40		6 ×4 ×·64	7 ×3 ×3 ×·38		6 ×4 ×·54
480 and under 540	·44	7½×3½×3½×·42		6½×4½×·60	7 ×3½×3½×·40		6 ×4 ×·64
540 and under 600	·44	8 ×3½×3½×·46		6½×4½×·64	7½×3½×3½×·46		6½×4½×·60
600 and under 670	·44	9 ×3½×3½×·46		6 ×6 ×·64	8 ×3½×3½×·46		6½×4½×·64
670 and under 740	·44	9 ×3½×3½×·60		6 ×6 ×·74	9 ×3½×3½×·46		6 ×6 ×·64
740 and under 820	·50	10 ×3½×3½×·60		7 ×7 ×·70	9 ×3½×3½×·60		6 ×6 ×·74
820 and under 900	·50	11 ×3½×3½×·60		7 ×7 ×·80	10 ×3½×3½×·60		7 ×7 ×·70
900 and under 990	·50	12 ×3½×3½×·60			11 ×3½×3½×·60		7 ×7 ×·80
990 and under 1090	·50	12 ×4 ×4 ×·64			12 ×3½×3½×·60		
1090 and under 1200	·50	12 ×3½×3½×·60	8×·60		12 ×4 ×4 ×·64		
1200 and under 1320	·50	12 ×3½×3½×·70	8×·70		12 ×3½×3½×·60	8×·60	
1320 and under 1450	·50	12 ×4 ×4 ×·70	9×·70		12 ×3½×3½×·70	8×·70	
1450 and under 1590	·54	12 ×4 ×4 ×·72	10×·74		12 ×4 ×4 ×·70	9×·70	
1590 and under 1740	·54				12 ×4 ×4 ×·72	10×·74	
1740 and under 1900	·54						
1900 and under 2070	·54						

1.* S is the fore and aft spacing of the pillars in feet from centre to centre.
B is one-third the breadth of vessel in feet at the deck when two rows of pillars are fitted, and one-fourth the breadth when three rows are fitted.
H is the height of the 'tween decks next above the girder, measured in feet from top of beam to top of beam, where the pillars in the 'tween decks are spaced the same as those below. In the case of decks fitted exclusively for the accommodation of passengers, and for upper, awning or shelter, bridge, poop or forecastle deck, H is to be taken as 5 feet.

Where the pillars above a deck are not placed over those below, H is to be the sum of the heights of the several tween decks in feet above the girder, with the addition of 5 feet for upper, awning or shelter deck, bridge, poop or forecastle deck.

2. For methods of obtaining the numbers regulating the scantlings for girders, *see* Sketches on pages 138 to 141.

3. The girders are to consist of double channels or double angles, intercostal plate and rider plate, of the scantlings given in the Table. (*See* Sketches on pages 132 and 133.)

4. The intercostal plates and channels or angles are to be fitted in long lengths and efficiently strapped or lapped at the butts to the Surveyor's satisfaction.

5. The channels are to be attached by two rivets to the lower flanges of the beams, or, in the case of angle or bulb angle beams to short angle lugs fitted to the beams, and where double angles are fitted in lieu of channels the intercostal plates are to be attached to the beams by angle lugs extending to the bottom of the girder and beams alternately where beams are fitted at every frame and to the bottom of the girder at every beam where beams are fitted at alternate frames. (*See* Sketch on page 133.)

6. The girders are to be efficiently bracketed to the bulkheads with plates three times the depth of the channels forming girders, measured from the upper edges of the channels and of the same thickness as the channels. The angle attaching the intercostal plate to the deck plating and intercostal plates to beams is to be of the same thickness as the plate, this angle is to be 3 ins. × 3 ins. where the rivets in the intercosaal plates are required to be ¾ in. in diameter, and 3½ ins × 3½ ins. where they are ⅞ in. in diameter. The channels and double angles to be zigzag riveted and the rivets spaced not more than 7 diameters apart, and those in the flanges of the intercostal angle not more than 5 diameters apart, centre to centre.

7. Girders of other form will be admitted provided they are of equivalent strength to those given in the Table.

GIRDERS AT HEADS OF WIDELY SPACED PILLARS.

TABLE 16.

(Concluded.)

NUMBERS * $\frac{S^2 \times B \times H}{100}$	Thickness of Intercostal Plate and Angle.	DEPTH OF BEAMS. 11 inches. SIZE OF GIRDERS. Double Channels. inches.	Rider Plate. inches.	Double Angles. inches.	12 inches. Double Channels. inches.	Rider Plate. inches.	Double Angles. inches.
150 and under 180	·34						
180 and under 210	·34						
210 and under 250	·34						
250 and under 290	·40						
290 and under 330	·40						
330 and under 380	·40			6 × 4 × ·40			
380 and under 430	·40			6 × 4 × ·44			6 × 4 × ·40
430 and under 480	·44			6 × 4 × ·50			6 × 4 × ·44
480 and under 540	·44	7 × 3 × 3 × ·38		6 × 4 × ·54			6 × 4 × ·50
540 and under 600	·44	7 × 3½ × 3½ × ·40		6 × 4 × ·64	7 × 3 × 3 × ·38		6 × 4 × ·54
600 and under 670	·44	7½ × 3½ × 3½ × ·46		6½ × 4½ × ·60	7 × 3½ × 3½ × ·40		6 × 4 × ·64
670 and under 740	·44	8 × 3½ × 3½ × ·46		6½ × 4½ × ·64	7½ × 3½ × 3½ × ·42		6½ × 4½ × ·60
740 and under 820	·50	9 × 3½ × 3½ × ·46		6 × 6 × ·64	8 × 3½ × 3½ × ·46		6½ × 4½ × ·64
820 and under 900	·50	9 × 3½ × 3½ × ·60		6 × 6 × ·74	9 × 3½ × 3½ × ·46		6 × 6 × ·64
900 and under 990	·50	10 × 3½ × 3½ × ·60		7 × 7 × ·70	9 × 3½ × 3½ × ·60		6 × 6 × ·74
990 and under 1090	·50	11 × 3½ × 3½ × ·60		7 × 7 × ·80	10 × 3½ × 3½ × ·60		7 × 7 × ·70
1090 and under 1200	·50	12 × 3½ × 3½ × ·60			11 × 3½ × 3½ × ·60		7 × 7 × ·80
1200 and under 1320	·50	12 × 4 × 4 × ·64			12 × 3½ × 3½ × ·60		
1320 and under 1450	·50	12 × 3½ × 3½ × ·60	8 × ·60		12 × 4 × 4 × ·64		
1450 and under 1590	·54	12 × 3½ × 3½ × ·70	8 × ·70		12 × 3½ × 3½ × ·60	8 × ·60	
1590 and under 1740	·54	12 × 4 × 4 × ·70	9 × ·70		12 × 3½ × 3½ × ·70	8 × ·70	
1740 and under 1900	·54	12 × 4 × 4 × ·72	11 × ·74		12 × 4 × 4 × ·72	10 × ·70	
1900 and under 2070	·54				12 × 4 × 4 × ·72	11 × ·82	

1.* S is the fore and aft spacing of the pillars in feet from centre to centre.

B is one-third the breadth of vessel in feet at the deck when two rows of pillars are fitted, and one-fourth the breadth when three rows are fitted.

H is the height of the 'tween decks next above the girder, measured in feet from top of beam to top of beam, where the pillars in the 'tween decks are spaced the same as those below. In the case of decks fitted exclusively for the accommodation of passengers, and for upper, awning or shelter, bridge, poop or forecastle deck, H is to be taken as 5 feet.

Where the pillars above a deck are not placed over those below, H is to be the sum of the heights of the several 'tween decks in feet above the girder, with the addition of 5 feet for upper, awning or shelter deck, bridge, poop or forecastle deck.

2. For methods of obtaining the numbers regulating the scantlings for girders, *see* Sketches on pages 138 to 141.

3. The girders are to consist of double channels or double angles, intercostal plate and rider plate, of the scantlings given in the Table. (*See* Sketches on pages 132 and 133.)

4. The intercostal plates and channels or angles are to be fitted in long lengths and efficiently strapped or lapped at the butts to the Surveyor's satisfaction.

5. The channels are to be attached by two rivets to the lower flanges of the beams, or, in the case of angle or bulb angle beams to short angle lugs fitted to the beams, and where double angles are fitted in lieu of channels the intercostal plates are to be attached to the beams by angle lugs extending to the bottom of the girder and beams alternately where beams are fitted at every frame and to the bottom of the girder at every beam where beams are fitted at alternate frames. (*See* Sketch on page 133.)

6. The girders are to be efficiently bracketed to the bulkheads with plates three times the depth of the channels forming girders, measured from the upper edges of the channels and of the same thickness as the channels. The angle attaching the intercostal plate to the deck plating and intercostal plates to beams is to be of the same thickness as the plate, this angle is to be 3 ins. × 3 ins. where the rivets in the intercostal plates are required to be ⅞ in. in diameter, and 3½ ins. × 3½ ins. where they are ⅞ in. in diameter. The channels and double angles to be zigzag riveted and the rivets spaced not more than 7 diameters apart, and those in the flanges of the intercostal angle not more than 5 diameters apart, centre to centre.

7. Girders of other form will be admitted provided they are of equivalent strength to those given in the Table.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING, LONDON.—*17th June, 1909.*

OUTSIDE PLATING.

TABLE 17.

(See Continuation.)

LONGITUDINAL NUMBER. L×(B+D).	BREADTH OF FLAT KEEL PLATE AND GARBOARD STRAKES.	FLAT KEEL PLATE. Thickness for $\frac{3}{5}$ length Amidships without Doubling.	FLAT KEEL PLATE. Thickness throughout if Doubled for $\frac{3}{5}$ length Amidships, also thickness at Ends if Keel Plate is fitted without Doubling.	THICKNESS OF GARBOARD STRAKE WITH BAR KEEL. For $\frac{1}{2}$ length Amidships.	THICKNESS OF GARBOARD STRAKE WITH BAR KEEL. At Ends.	THICKNESS OF OUTSIDE PLATING. From Flat Keel Plate or Garboard Strake to Upper Turn of Bilge. For $\frac{1}{2}$ length Amidships	THICKNESS OF OUTSIDE PLATING. From Flat Keel Plate or Garboard Strake to Upper Turn of Bilge. At Ends.	THICKNESS OF OUTSIDE PLATING. From Upper Turn of Bilge to Strake below Sheerstrake. For $\frac{1}{2}$ length Amidships.	THICKNESS OF OUTSIDE PLATING. From Upper Turn of Bilge to Strake below Sheerstrake. At Ends.	THICKNESS OF OUTSIDE PLATING. Propeller Boss Plates.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
1250 and under 1500	30	·36	·30	·28	·24	·24	·24	·24	·24	·24
1500 ,, 1750	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,
1750 ,, 2000	31	·38	·32	·30	·26	·26	,,	,,	,,	·26
2000 ,, 2250	,,	·40	·34	,,	,,	,,	,,	·26	,,	,,
2250 ,, 2500	32	,,	,,	·32	·28	·28	·26	,,	,,	·28
2500 ,, 2750	,,	·42	·36	,,	,,	,,	,,	·28	·26	,,
2750 ,, 3000	33	·44	,,	·34	·30	·30	,,	,,	,,	·30
3000 ,, 3350	,,	,,	,,	,,	,,	,,	,,	·30	,,	,,
3350 ,, 3700	34	·46	·38	·36	·32	·32	·28	,,	,,	·32
3700 ,, 4050	,,	·48	·40	,,	,,	,,	,,	·32	·28	,,
4050 ,, 4400	35	,,	,,	·38	·34	·34	·30	,,	,,	·34
4400 ,, 4800	,,	·50	·42	,,	,,	,,	,,	·34	·30	,,
4800 ,, 5200	36	·52	,,	·40	·36	·36	·32	,,	,,	·36
5200 ,, 5650	,,	,,	,,	,,	,,	,,	,,	·36	·32	,,
5650 ,, 6100	37	·54	·44	·42	·38	·38	·34	,,	,,	·38
6100 ,, 6600	,,	·56	·46	,,	,,	,,	,,	·38	·34	,,
6600 ,, 7100	38	,,	,,	·44	·40	·40	·36	,,	,,	·40
7100 ,, 7650	,,	·58	,,	,,	,,	,,	,,	·40	·36	,,
7650 ,, 8200	39	·60	·48	·46	·42	·42	,,	,,	,,	·42
8200 ,, 8900	,,	·62	,,	,,	,,	,,	,,	·42	,,	,,
8900 ,, 9600	40	·64	·50	·48	,,	·44	·38	,,	,,	·44
9600 ,, 10300	,,	·66	,,	,,	,,	,,	,,	·44	·38	,,
10300 ,, 11000	41	·68	·52	·50	·44	·46	,,	,,	,,	·46
11000 ,, 11800	,,	·70	,,	,,	,,	,,	,,	·46	,,	·48
11800 ,, 12600	42	·72	·54	·52	·46	·48	·40	,,	,,	·50
12600 ,, 13600	,,	·74	,,	,,	,,	,,	,,	·48	·40	·52
13600 ,, 14600	,,	·76	·56	·54	·48	·50	,,	,,	,,	·54
14600 ,, 15800	43	·78	,,	,,	,,	,,	,,	·50	,,	·56
15800 ,, 17000	,,	·80	·58	·56	,,	·52	·42	,,	,,	·58
17000 ,, 18200	,,	·82	,,	,,	,,	,,	,,	·52	,,	·60
18200 ,, 19500	44	,,	,,	·58	·50	·54	,,	,,	,,	·62
19500 ,, 20800	,,	·84	·60	,,	,,	,,	,,	·54	·42	·64
20800 ,, 22200	,,	·86	·62	·60	·52	·56	·44	,,	,,	·66
22200 ,, 23600	45	·88	,,	,,	,,	,,	,,	·56	,,	,,
23600 ,, 25000	,,	·90	·64	·62	·54	·58	,,	,,	,,	·68
25000 ,, 26400	,,	,,	,,	,,	,,	,,	,,	·58	·44	,,
26400 ,, 27800	46	·92	·66	·64	,,	·60	·46	,,	,,	·70
27800 ,, 29200	,,	·94	,,	,,	,,	,,	,,	·60	,,	,,

OUTSIDE PLATING.

TABLE **17.**

(*See Continuation.*)

LONGITUDINAL. NUMBER. L×(B+D).	BREADTH OF FLAT KEEL PLATE AND GAR-BOARD STRAKES.	FLAT KEEL PLATE, Thickness for $\frac{3}{5}$ length Amidships without Doubling.	FLAT KEEL PLATE, Thickness throughout if Doubled for $\frac{3}{5}$ length Amidships, also thickness at Ends if Keel Plate is fitted without Doubling.	THICKNESS OF GARBOARD STRAKE WITH BAR KEEL. For $\frac{1}{2}$ length Amidships.	THICKNESS OF GARBOARD STRAKE WITH BAR KEEL. At Ends.	THICKNESS OF OUTSIDE PLATING. From Flat Keel Plate or Garboard Strake to Upper Turn of Bilge. For $\frac{1}{2}$ length Amidships.	THICKNESS OF OUTSIDE PLATING. From Flat Keel Plate or Garboard Strake to Upper Turn of Bilge. At Ends.	THICKNESS OF OUTSIDE PLATING. From Upper Turn of Bilge to Strake below Sheerstrake. For $\frac{1}{2}$ length Amidships.	THICKNESS OF OUTSIDE PLATING. From Upper Turn of Bilge to Strake below Sheerstrake. At Ends.	THICKNESS OF OUTSIDE PLATING. Propeller Boss Plates.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
29200 and under 30600	46	·96	·68	·66	·56	·62	·46	·60	·44	·72
30600 „ 32000	47	·98	·70	„	„	„	„	·62	„	„
32000 „ 33400	„	1·00	„	·68	·58	·64	·48	„	„	·74
33400 „ 34800	„	1·02	·72	„	„	„	„	·64	·46	„
34800 „ 36200	48	1·04	„	·70	·60	·66	„	„	„	·76
36200 „ 37600	„	1·06	·74	„	„	„	„	„	„	„
37600 „ 39000	„	1·08	·76	·72	·62	·68	·50	·66	„	·78
39000 „ 40400	49	1·10	„	„	„	„	„	„	„	„
40400 „ 41800	„	1·12	·78			·70	„	·68	·48	·80
41800 „ 43200	„	1·14	·80			„	„	„	„	„
43200 „ 44600	50	1·16	„			·72	·52	„	„	·82
44600 „ 46000	„	1·18	·82			„	„	·70	„	„
46000 „ 47400	„	1·20	„			·74	„	„	„	·84
47400 „ 48800	51		·84			„	„	·72	·50	„
48800 „ 50200	„		„			·76	·54	„	„	·86
50200 „ 51600	„		·86			„	„	„	„	„
51600 „ 53000	52		„			·78	„	·74	„	·88
53000 „ 54400	„		·88			„	„	„	„	„
54400 „ 55800	„		„			·80	·56	·76	·52	·90
55800 „ 57200	53		·90			„	„	„	„	„
57200 „ 58600	„		„			·82	„	„	„	·92
58600 „ 60000	„		·92			„	„	·78	„	„
60000 „ 61400	54		„			·84	·58	„	„	·94
61400 „ 62800	„		·94			„	„	·80	·54	„
62800 „ 64200	„		„			·86	„	„	„	·96
64200 „ 65600	55		·96			„	„	„	„	„
65600 „ 67000	„		„			·88	·60	·82	·56	·98
67000 „ 68400	„		·98			„	„	„	„	„
68400 „ 69800	56		„			·90	„	·84	„	1·00
69800 „ 71200	„		1·00			„	„	„	„	„
71200 „ 72600	„		„			·92	·62	„	„	1·02
72600 „ 74000	57		1·02			„	„	·86	·58	„
74000 „ 75400	„		„			·94	„	„	„	1·04
75400 „ 76800	„		1·04			„	„	·88	„	„
76800 „ 78200	58		„			·96	·64	„	„	1·06
78200 „ 79600	„		1·06			„	„	„	„	„
79600 „ 81000	„		„			·98	„	·90	·60	1·08

LOWER DECKS.

TABLE 17.

(*See Continuation.*)

LONGITUDINAL NUMBER. L × (B + D).	2ND DECK (UPPER DECK IN AWNING OR SHELTER DECK VESSELS). Stringer for ½ length Amidships.	2ND DECK: Tie Plates for ½ length Amidships.	3RD DECK (2ND DECK IN AWNING OR SHELTER DECK VESSELS). Stringer for ½ length Amidships.	3RD DECK: Tie Plates for ½ length Amidships.	DECKS BELOW 3RD DECK (2ND DECK IN AWNING OR SHELTER DECK VESSELS). Stringer for ½ length Amidships.	DECKS BELOW 3RD DECK: Tie Plates for ½ length Amidships.	BEAM STRINGERS AT ENDS OF 2ND DECK (UPPER DECK IN AWNING OR SHELTER DECK VESSELS) AND ALL DECKS BELOW, ALSO THICKNESS OF TIE PLATES AT ENDS.	THICKNESS OF 2ND AND 3RD DECKS (UPPER AND 2ND DECKS IN AWNING OR SHELTER DECK VESSELS) AT ENDS.	DECK STRINGER ANGLES AT ALL LOWER DECKS, AND AT UPPER DECKS IN WAY OF ERECTIONS. For ½ length Amidships.	DECK STRINGER ANGLES: At Ends.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
1250 and under 1500									2½ × 2½ × ·22	·22
1500 ” 1750									” ” ”	”
1750 ” 2000									” ” ·24	·24
2000 ” 2250									” ” ”	”
2250 ” 2500									” ” ”	”
2500 ” 2750									” ” ·26	·26
2750 ” 3000									” ” ”	”
3000 ” 3350									” ” ·28	·28
3350 ” 3700									” ” ”	”
3700 ” 4050									” ” ”	”
4050 ” 4400									3 × 3 × ”	”
4400 ” 4800									” ” ”	”
4800 ” 5200									” ” ·30	·30
5200 ” 5650									” ” ”	”
5650 ” 6100									” ” ·32	·32
6100 ” 6600									” ” ”	”
6600 ” 7100									” ” ”	”
7100 ” 7650									” ” ·34	”
7650 ” 8200									” ” ”	”
8200 ” 8900									” ” ”	”
8900 ” 9600	40 × ·34	9 × ·34					18 × ·34		” ” ”	·34
9600 ” 10300	” ”	” ”					19 ”		” ” ”	”
10300 ” 11000	41 × ·36	10 × ·36					20 ”		” ” ·36	”
11000 ” 11800	” ”	” ”					21 ”		” ” ”	”
11800 ” 12600	42 ”	” ”					22 × ·36		” ” ”	·36
12600 ” 13600	” ·38	11 × ·38					23 ”		3½ × 3½ × ·38	”
13600 ” 14600	” ”	” ”					24 ”		” ” ”	”
14600 ” 15800	43 ”	” ”					25 ”		” ” ”	”
15800 ” 17000	” ·40	12 × ·40	43 × ·38	12 × ·38			26 × ·38		” ” ·40	·38
17000 ” 18200	” ”	” ”	” ”	” ”			27 ”		” ” ”	”
18200 ” 19500	44 ”	” ”	44 ”	” ”			28 ”		” ” ”	”
19500 ” 20800	” ·42	13 × ·42	” ”	13 ”			29 ”		” ” ·42	”
20800 ” 22200	” ”	” ”	” ·40	” ·40			30 × ·40		” ” ”	·40
22200 ” 23600	45 ”	” ”	45 ”	” ”			31 ”		” ” ”	”
23600 ” 25000	” ·44	14 × ·44	” ”	14 ”			32 ”		” ” ·44	”
25000 ” 26400	” ”	” ”	” ”	” ”			” ”		” ” ”	”
26400 ” 27800	46 ”	” ”	46 × ·42	” ·42			33 × ·42		” ” ”	·42
27800 ” 29200	” ·46	15 × ·46	” ”	15 ”			” ”		” ” ·46	”

LOWER DECKS.

TABLE 17.

(See Continuation.)

LONGITUDINAL NUMBER. $L \times (B+D)$.	2ND DECK (UPPER DECK IN AWNING OR SHELTER DECK VESSELS). Stringer for $\frac{1}{2}$ length Amidships.	2ND DECK (UPPER DECK IN AWNING OR SHELTER DECK VESSELS). Tie Plates and Deck Plating for $\frac{1}{2}$ length Amidships.	3RD DECK (2ND DECK IN AWNING OR SHELTER DECK VESSELS). Stringer for $\frac{1}{2}$ length Amidships.	3RD DECK (2ND DECK IN AWNING OR SHELTER DECK VESSELS). Tie Plates and Deck Plating for $\frac{1}{2}$ length Amidships.	DECKS BELOW 3RD DECK (2ND DECK IN AWNING OR SHELTER DECK VESSELS). Stringer for $\frac{1}{2}$ length Amidships.	DECKS BELOW 3RD DECK (2ND DECK IN AWNING OR SHELTER DECK VESSELS). Tie Plates for $\frac{1}{2}$ length Amidships.	BEAM STRINGERS AT ENDS OF 2ND DECK (UPPER DECK IN AWNING OR SHELTER DECK VESSELS) AND ALL DECKS BELOW, ALSO THICKNESS OF TIE PLATES AT ENDS.	THICKNESS OF 2ND AND 3RD DECKS (UPPER AND 2ND DECKS IN AWNING OR SHELTER DECK VESSELS) AT ENDS.	DECK STRINGER ANGLES AT ALL LOWER DECKS, AND AT UPPER DECKS IN WAY OF ERECTIONS. For $\frac{1}{2}$ length Amidships.	DECK STRINGER ANGLES AT ALL LOWER DECKS, AND AT UPPER DECKS IN WAY OF ERECTIONS. At Ends.
	inches.	inches.	inches.	inches.	inches.	inches	inches.	inches.	inches.	inches.
29200 and under 30600	46 × ·46	15 × ·46	46 × ·42	15 × ·42			34 × ·42		$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	·42
30600 ” 32000	47 ”	” ”	47 ”	” ”			” ”		” ” ”	”
32000 ” 33400	” ·48	Dk. ·36 Pltg.	” ·44	16 × ·44			35 × ·44	·30	” ” ·48	·44
33400 ” 34800	” ”	”	” ”	” ”			” ”	”	” ” ”	”
34800 ” 36200	48 ”	·38	48 ”	” ”			36 ”	”	” ” ”	”
36200 ” 37600	” ”	”	” ”	17 ”			” ”	”	” ” ”	”
37600 ” 39000	” ”	·40	” ”	” ”			37 ”	·32	” ” ”	”
39000 ” 40400	49 ”	”	49 ”	” ”			” ”	”	” ” ”	”
40400 ” 41800	” ·50	”	” ”	18 ”			” ”	”	4 × 4 × ·50	”
41800 ” 43200	” ”	”	” ”	” ”			38 ”	”	” ” ”	”
43200 ” 44600	50 ”	”	50 ”	” ”			” ”	”	” ” ”	”
44600 ” 46000	” ”	·42	” ”	19 ”	50 × ·44	19 × ·44	” ”	”	” ” ”	”
46000 ” 47400	” ”	”	” ”	Dk. ·36 Pltg.	” ”	” ”	39 ”	”	” ” ”	”
47400 ” 48800	51 ”	”	51 ”	”	51 ”	” ”	” ”	”	” ” ”	”
48800 ” 50200	” ·52	”	” ·46	”	” ·46	20 × ·46	” ·46	”	” ” ·52	·46
50200 ” 51600	” ”	”	” ”	”	” ”	” ”	40 ”	”	” ” ”	”
51600 ” 53000	52 ”	·44	52 ”	”	52 ”	” ”	” ”	”	” ” ”	”
53000 ” 54400	” ”	”	” ”	”	” ”	21 ”	” ”	”	” ” ”	”
54400 ” 55800	” ”	”	” ”	·38	” ”	” ”	41 ”	·34	” ” ”	”
55800 ” 57200	53 ”	”	53 ”	”	53 ”	” ”	” ”	”	” ” ”	”
57200 ” 58600	” ·54	·46	” ”	”	” ”	22 ”	” ”	”	” ” ·54	”
58600 ” 60000	” ”	”	” ”	”	” ”	” ”	42 ”	”	” ” ”	”
60000 ” 61400	54 ”	”	54 ”	”	54 ”	” ”	” ”	”	” ” ”	”
61400 ” 62800	” ”	”	” ”	·40	” ”	23 ”	” ”	”	” ” ”	”
62800 ” 64200	” ”	·48	” ·48	”	” ·48	” ·48	43 × ·48	”	” ” ”	·48
64200 ” 65600	55 ”	”	55 ”	”	55 ”	” ”	” ”	”	” ” ”	”
65600 ” 67000	” ·56	”	” ”	”	” ”	24 ”	” ”	”	” ” ·56	”
67000 ” 68400	” ”	·50	” ”	”	” ”	” ”	44 ”	”	” ” ”	”
68400 ” 69800	56 ”	”	56 × ·50	·42	56 × ·50	” ·50	” ”	·36	” ” ”	”
69800 ” 71200	” ·58	”	” ”	”	” ”	25 ”	” ”	”	” ” ·58	”
71200 ” 72600	” ”	·52	” ”	”	” ”	” ”	45 ”	”	” ” ”	”
72600 ” 74000	57 ”	”	57 ”	”	57 ”	” ”	” ·50	”	” ” ”	·50
74000 ” 75400	” ·60	”	” ·52	”	” ·52	26 × ·52	” ”	”	” ” ·60	”
75400 ” 76800	” ”	·54	” ”	·44	” ”	” ”	” ”	”	” ” ”	”
76800 ” 78200	58 ”	”	58 ”	”	58 ”	” ”	46 ”	”	” ” ”	”
78200 ” 79600	” ·62	”	” ”	”	” ”	27 ”	” ”	”	” ” ·62	”
79600 ” 81000	” ”	·56	” ·54	”	” ·54	” ”	” ”	”	” ” ”	”

In a vessel requiring two steel decks the thickness of the stringers and deck plating of the 2nd deck may in way of a "long" bridge be as required for a 3rd deck, but in no case is the deck plating to be less than ·36 of an inch in thickness.

"SHORT" ERECTIONS.

TABLE 17.

(See Continuation.)

LONGITUDINAL NUMBER. L × (B + D)	"SHORT" ERECTIONS. POOPS				"SHORT" BRIDGES.					FORECASTLES.			
	Side Plating	Stringer Angle.	Stringer Plate.	Tie Plates.	Maximum Length of "Short" Bridge.	Side Plating	Stringer Angle.	Stringer Plate.	Tie Plates and Deck Plating.	Side Plating	Stringer Angle.	Stringer Plate.	Tie Plates.
	inches.	inches.	inches.	inches.	feet.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
1250 and under 1500	·22	2½ × 2½ × ·22	10 × ·22	5 × ·22	20	·22	2½ × 2½ × ·22	14 × ·22	5 × ·22	·22	2½ × 2½ × ·22	10 × ·22	5 × ·22
1500 „ 1750	„	„ „ „	„ „	„ „	„	„	„ „ „	15 „	„ „	„	„ „ „	„ „	„ „
1750 „ 2000	„	„ „ „	11 „	„ „	„	„	„ „ „	16 „	„ „	„	„ „ „	11 „	„ „
2000 „ 2250	„	„ „ „	„ „	„ „	25	„	„ „ „	17 „	„ „	„	„ „ „	„ „	„ „
2250 „ 2500	„	„ „ „	„ „	„ „	„	„	„ „ „	18 „	„ „	„	„ „ „	„ „	„ „
2500 „ 2750	„	„ „ „	12 „	„ „	„	„	„ „ „	19 „	6 „	„	„ „ „	12 „	„ „
2750 „ 3000	„	„ „ „	„ „	6 „	30	„	„ „ „	20 „	„ „	„	„ „ „	„ „	6 „
3000 „ 3350	·24	„ „ ·24	„ ·24	„ ·24	„	·24	„ „ ·24	„ ·24	„ ·24	·24	„ „ ·24	„ ·24	„ ·24
3350 „ 3700	„	„ „ „	13 „	„ „	„	„	„ „ „	22 „	„ „	„	„ „ „	13 „	„ „
3700 „ 4050	„	„ „ „	„ „	„ „	35	„	„ „ „	23 „	„ „	„	„ „ „	„ „	„ „
4050 „ 4400	„	„ „ „	„ „	„ „	„	„	„ „ „	24 „	„ „	„	„ „ „	„ „	„ „
4400 „ 4800	„	„ „ „	14 „	„ „	„	„	„ „ „	25 „	„ „	„	„ „ „	14 „	„ „
4800 „ 5200	„	„ „ „	„ „	„ „	40	„	„ „ „	26 „	„ „	„	„ „ „	„ „	„ „
5200 „ 5650	„	3 × 3 „	„ „	„ „	„	„	3 × 3 „	27 „	„ „	„	3 × 3 „	„ „	„ „
5650 „ 6100	·26	„ „ ·26	15 × ·26	„ ·26	„	·26	„ „ ·26	28 × ·26	„ ·26	·26	„ „ ·26	15 × ·26	„ ·26
6100 „ 6600	„	„ „ „	„ „	„ „	45	„	„ „ „	29 „	7 „	„	„ „ „	„ „	„ „
6600 „ 7100	„	„ „ „	16 „	7 „	„	„	„ „ „	30 „	„ „	„	„ „ „	16 „	7 „
7100 „ 7650	„	„ „ „	„ „	„ „	„	·28	„ „ ·28	31 „	„ ·28	·28	„ „ ·28	„ ·28	„ ·28
7650 „ 8200	·28	„ „ ·28	17 × ·28	„ ·28	50	„	„ „ „	32 „	„ „	„	„ „ „	17 „	„ „
8200 „ 8900	„	„ „ „	„ „	„ „	„	„	„ „ „	33 „	„ „	„	„ „ „	„ „	„ „
8900 „ 9600	„	„ „ „	18 „	„ „	„	·30	„ „ ·30	34 × ·30	„ ·30	·30	„ „ „	18 „	„ „
9600 „ 10300	„	„ „ „	19 „	„ „	55	„	„ „ „	35 „	„ „	„	„ „ „	19 „	„ „
10300 „ 11000	·30	„ „ ·30	20 × ·30	„ ·30	„	„	„ „ „	36 „	„ „	„	„ „ ·30	20 × ·30	„ ·30
11000 „ 11800	„	„ „ „	21 „	„ „	„	·32	„ „ ·32	37 × ·32	„ ·32	·32	„ „ „	21 „	„ „
11800 „ 12600	„	„ „ „	22 „	„ „	60	„	„ „ „	38 „	8	„	„ „ „	22 „	„ „
12600 „ 13600	„	„ „ „	23 „	8 „	„	„	„ „ „	39 „	„ „	„	„ „ „	23 „	8 „
13600 „ 14600	·32	„ „ „	24 „	„ „	„	·34	„ „ ·34	40 × ·34	„ ·34	·34	„ „ „	24 „	„ „
14600 „ 15800	„	„ „ „	25 „	„ „	65	„	„ „ „	41 „	„ „	„	„ „ „	25 „	„ „
15800 „ 17000	„	„ „ ·32	26 × ·32	„ ·32	„	„	„ „ „	42 „	„ „	„	„ „ ·32	26 × ·32	„ ·32
17000 „ 18200	„	„ „ „	27 „	„ „	„	·36	„ „ ·36	„ ·36	„ ·36	·36	„ „ „	27 „	„ „
18200 „ 19500	·34	„ „ „	28 „	„ „	70	„	„ „ „	43 „	„ „	„	„ „ „	28 „	„ „
19500 „ 20800	„	„ „ „	29 „	„ „	„	„	„ „ „	„ „	„ „	„	„ „ „	29 „	„ „
20800 „ 22200	„	„ „ „	30 „	„ „	„	·38	„ „ „	44 × ·38	„ ·38	·38	„ „ „	30 „	„ „
22200 „ 23600	„	„ „ „	31 „	„ „	75	„	„ „ „	„ „	9 „	„	„ „ „	31 „	„ „
23600 „ 25000	·36	„ „ „	32 „	9 „	„	„	„ „ „	45 „	„ „	„	„ „ „	32 „	9 „
25000 „ 26400	„	3½ × 3½ × ·34	„ ·34	„ ·34	„	„	3½ × 3½ „	„ „	„ „	„	3½ × 3½ × ·34	„ ·34	„ ·34
26400 „ 27800	„	„ „ „	33 „	„ „	80	·40	„ „ ·40	38 × ·40	Dk. Pltg. ·26	·40	„ „ „	33 „	„ „
27800 „ 29200	„	„ „ „	„ „	„ „	„	„	„ „ „	„ „	„	„	„ „ „	„ „	„ „

"SHORT" ERECTIONS. TABLE 17.

(Concluded.)

LONGITUDINAL NUMBER. L × (B + D)	"SHORT" ERECTIONS. POOPS. Side Plating	POOPS. Stringer Angle.	POOPS. Stringer Plate.	POOPS. Tie Plates.	"SHORT" BRIDGES. Maximum Length of "Short" Bridge.	"SHORT" BRIDGES. Side Plating	"SHORT" BRIDGES. Stringer Angle.	"SHORT" BRIDGES. Stringer Plate.	"SHORT" BRIDGES. Deck Plating.	FORECASTLES. Side Plating	FORECASTLES. Stringer Angle.	FORECASTLES. tringer Plate.	FORECASTLES. Tie Plates and Deck Plating.
	inches.	inches.	inches.	inches.	feet	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
29200 and under 30600	·38	3½ × 3½ × ·34	34 × ·34	9 × ·34	80	40	3½ × 3½ × ·40	39 × ·40	·26	·40	3½ × 3½ × ·34	34 × ·34	9 × ·34
30600 „ 32000	”	” ” ”	” ”	” ”	”	”	” ” ”	” ”	·28	”	” ” ”	” ”	” ”
32000 „ 33400	”	” ” ”	35 ”	” ”	85	”	” ” ”	” ”	”	”	” ” ”	35 ”	” ”
33400 „ 34800	”	” ” ·36	” ·36	” ·36	”	·42	” ” ·42	40 × ·42	”	·42	” ” ·36	” ·36	” ·36
34800 „ 36200	”	” ” ”	36 ”	” ”	”	”	” ” ”	” ”	·30	”	” ” ”	36 ”	” ”
36200 „ 37600	·40	” ” ”	” ”	” ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	” ”
37600 „ 39000	”	” ” ”	37 ”	” ”	”	”	” ” ”	41 ”	”	”	” ” ”	37 ”	” ”
39000 „ 40400	”	” ” ”	” ”	” ”	90	”	” ” ”	” ”	·32	”	” ” ”	” ”	” ”
40400 „ 41800	”	” ” ”	” ”	10 ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	10 ”
41800 „ 43200	”	” ” ”	38 ”	” ”	”	·44	” ” ·44	42 × ·44	”	·44	” ” ”	38 ”	” ”
43200 „ 44600	”	” ” ·38	” ·38	” ·38	”	”	” ” ”	” ”	·34	”	” ” ·38	” ·38	” ·38
44600 „ 46000	”	” ” ”	” ”	” ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	” ”
46000 „ 47400	·42	” ” ”	39 ”	” ”	”	”	” ” ”	43 ”	”	”	” ” ”	39 ”	” ”
47400 „ 48800	”	” ” ”	” ”	” ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	” ”
48800 „ 50200	”	” ” ”	” ”	” ”	95	”	” ” ”	” ”	·36	”	” ” ”	” ”	” ”
50200 „ 51600	”	” ” ”	40 ”	” ”	”	·46	” ” ·46	44 × ·46	”	·46	” ” ”	40 ”	” ”
51600 „ 53000	”	” ” ·40	” ·40	” ·40	”	”	” ” ”	” ”	”	”	” ” ·40	” ·40	” ·40
53000 „ 54400	”	” ” ”	” ”	” ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	” ”
54400 „ 55800	”	” ” ”	41 ”	” ”	”	”	” ” ”	45 ”	·38	”	” ” ”	35 ”	Dk. Pltg. ·38
55800 „ 57200	·44	” ” ”	” ”	11 ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	”
57200 „ 58600	”	” ” ”	” ”	” ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	”
58600 „ 60000	”	” ” ”	42 ”	” ”	”	·48	” ” ·48	46 × ·48	”	·48	” ” ”	36 ”	”
60000 „ 61400	”	” ” ”	” ”	” ”	100	”	4 × 4 ”	” ”	·40	”	” ” ”	” ”	”
61400 „ 62800	”	” ” ·42	” ·42	” ·42	”	”	” ” ”	” ”	”	”	” ” ·42	” ·42	”
62800 „ 64200	”	” ” ”	43 ”	” ”	”	”	” ” ”	47 ”	”	”	” ” ”	37 ”	”
64200 „ 65600	”	” ” ”	” ”	” ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	”
65600 „ 67000	·46	” ” ”	” ”	” ”	”	”	” ” ”	” ”	·42	”	” ” ”	” ”	”
67000 „ 68400	”	” ” ”	44 ”	” ”	”	·50	” ” ·50	48 × ·50	”	·50	” ” ”	38 ”	”
68400 „ 69800	”	” ” ”	” ”	” ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	”
69800 „ 71200	”	” ” ”	” ”	” ”	”	”	” ” ”	” ”	”	”	” ” ”	” ”	”
71200 „ 72600	”	” ” ”	45 ”	” ”	105	”	” ” ”	49 ”	·44	”	” ” ”	39 ”	·40
72600 „ 74000	”	” ” ·44	” ·44	” ·44	”	”	” ” ”	” ”	”	”	” ” ·44	” ·44	”
74000 „ 75400	”	4 × 4 ”	” ”	12 ”	”	”	” ” ”	” ”	”	”	4 × 4 ”	” ”	”
75400 „ 76800	·48	” ” ”	” ”	” ”	”	·52	” ” ·52	50 × ·52	”	·52	” ” ”	” ”	”
76800 „ 78200	”	” ” ”	46 ”	” ”	”	”	” ” ”	” ”	·46	”	” ” ”	40 ”	”
78200 „ 79600	”	” ” ”	” ”	” ”	”	”	” ” ·58	” ”	”	”	” ” ”	” ”	”
79600 „ 81000	”	” ” ”	” ”	” ”	”	”	” ” ”	51 ”	”	”	” ” ”	” ”	”

TOPSIDE PLATING, DECK and STRINGER PLATES at UPPER, AWNING or SHELTER DECKS, and "LONG" BRIDGES.

TABLE 18.

(See Continuation.)

LONGITUDINAL NUMBER. L × (B + D).	BREADTH OF SHEERSTRAKE AND STRAKE BELOW.	PROPORTIONS OF LENGTH TO DEPTH.									
		Under 10.					10 and under 11.				
		Sheerstrake for ½ length amidships.	Strake below Sheerstrake for ½ length amidships.	Stringer Angle for ½ length amidships.	Stringer Plate for ½ length amidships.	Tie Plates and Deck Plating for ½ length amidships.	Sheerstrake for ½ length amidships	Strake below Sheerstrake for ½ length amidships.	Stringer Angle for ½ length amidships.	Stringer Plate for ½ length amidships.	Tie Plates and Deck Plating for ½ length amidships.
	inches.	inches	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
1400 and under 1650	30	·24	·24	2½ × 2½ × ·24	14 × ·22	5 × ·22	·26	·24	2½ × 2½ × ·24	16 × ·22	5 × ·22
1650 „ 1900	„	·26	„	„ „ „	15 „	6 „	·28	„	„ „ „	17 „	6 „
1900 „ 2150	31	„	·26	„ „ ·26	16 × ·24	„ ·24	„	·26	„ „ ·26	18 × ·24	„ ·24
2150 „ 2400	„	·28	„	3 × 3 × „	17 „	„ „	·30	„	3 × 3 „	19 „	„ „
2400 „ 2650	32	„	·28	„ „ ·28	18 × ·26	„ ·26	„	·28	„ „ ·28	20 × ·26	„ ·26
2650 „ 2900	„	·30	„	„ „ „	19 „	„ „	·32	„	„ „ „	21 „	„ „
2900 „ 3150	33	„	·30	„ „ ·30	20 × ·28	„ ·28	„	·30	„ „ ·30	22 × ·28	„ ·28
3150 „ 3500	„	·32	„	„ „ „	21 „	7 „	·34	„	„ „ „	23 „	7 „
3500 „ 3850	34	„	·32	„ „ ·32	22 × ·30	„ ·30	„	·32	„ „ ·32	24 × ·30	„ ·30
3850 „ 4200	„	·34	„	„ „ „	23 „	„ „	·36	„	„ „ „	25 „	„ „
4200 „ 4600	35	„	·34	„ „ ·34	24 × ·32	„ ·32	„	·34	„ „ ·34	26 × ·32	„ ·32
4600 „ 5000	„	·36	„	„ „ „	25 „	8 „	·38	„	„ „ „	27 „	8 „
5000 „ 5400	36	„	·36	„ „ ·36	26 × ·34	„ ·34	„	·36	„ „ ·36	28 × ·34	„ ·34
5400 „ 5800	„	·38	„	„ „ „	28 „	„ „	·40	„	„ „ „	30 „	„ „
5800 „ 6300	37	„	·38	„ „ ·38	30 × ·36	„ ·36	„	·38	„ „ ·38	32 × ·36	„ ·36
6300 „ 6800	„	·40	„	„ „ „	32 „	9 „	·42	„	„ „ „	34 „	9 „
6800 „ 7300	38	„	·40	„ „ ·40	34 × ·38	„ ·38	·44	·40	„ „ ·40	36 × ·38	„ ·38
7300 „ 7900	„	·42	„	„ „ „	36 „	10 „	„	„	„ „ „	38 „	10 „
7900 „ 8500	39	„	·42	„ „ ·42	38 × ·40	„ ·40	·46	·42	„ „ ·42	40 × ·40	„ ·40
8500 „ 9200	„	·44	„	3½ × 3½ „	40 „	11 „	„	„	3½ × 3½ „	42 „	11 „
9200 „ 9900	40	„	·44	„ „ ·44	42 × ·42	„ ·42	·48	·44	„ „ ·44	44 × ·42	„ ·42
9900 „ 10600	„	·46	„	„ „ „	44 „	12 „	„	„	„ „ „	46 „	12 „
10600 „ 11400	41	„	·46	„ „ ·46	46 × ·44	„ ·44	·50	·46	„ „ ·46	48 × ·44	„ ·44
11400 „ 12200	„	·48	„	4 × 4 „	48 „	13 „	„	„	4 × 4 „	50 „	13 „
12200 „ 13100	42	„	·48	„ „ ·48	50 × ·46	„ ·46	·52	·48	„ „ ·48	52 × ·46	„ ·46
13100 „ 14100	„	·50	„	„ „ „	52 „	14 „	„	„	„ „ „	54 „	14 „
14100 „ 15200	„	„	·50	„ „ „	54 × ·48	„ ·48	·54	·50	„ „ „	56 × ·48	„ ·48
15200 „ 16400	43	·52	„	4½ × 4½ „	56 „	15 „	„	„	4½ × 4½ „	42 „	Dk ·30 for ½ L.
16400 „ 17600	„	„	·52	„ „ ·50	41 × ·48	Dk ·30 for ½ L.	·56	·52	„ „ ·50	43 „	„
17600 „ 18800	„	·54	„	„ „ „	42 × ·48	„	·58	„	„ „ „	44 × ·50	„
18800 „ 20100	44	„	·54	„ „ ·52	43 „	„	„	·54	„ „ ·52	45 „	Cmpl. ·30 deck.
20100 „ 21500	„	·56	„	„ „ „	44 „	Cmpl. ·30 deck.	·60	„	„ „ „	46 „	„
21500 „ 22900	„	„	·56	„ „ ·54	45 „	„	„	·56	„ „ ·54	47 „	·32
22900 „ 24300	45	·58	„	„ „ „	46 × ·50	„	·62	„	„ „ „	48 × ·52	„
24300 „ 25700	„	„	·58	„ „ ·56	47 „	·32	„	·58	„ „ ·56	49 „	·34
25700 „ 27100	„	·60	„	„ „ „	48 „	„	·64	„	„ „ „	50 „	„
27100 „ 28500	46	„	·60	„ „ „	49 „	·34	„	·60	„ „ „	51 „	·36
28500 „ 29900	„	·62	„	„ „ „	50 × „	„	·66	„	„ „ „	52 × ·54	„

The topside scantlings and decks before and abaft a bridge are to be determined by the vessel's proportions taken to the upper deck. These scantlings are to be maintained throughout the length of a "short" bridge, and are to be extended within the ends of a "long" bridge for a distance equal to one-third the breadth of the vessel.

The upper deck stringer angles in the above Table may be gradually reduced at the ends of the vessel to the size given in Table 17 for upper deck stringer angles at ends in way of erections.

TOPSIDE PLATING, DECK and STRINGER PLATES at UPPER AWNING or SHELTER DECKS, and "LONG" BRIDGES.

TABLE 18.

(See Continuation.)

LONGITUDINAL NUMBER. L×(B+D).	BREADTH OF SHEERSTRAKE AND STRAKE BELOW.	PROPORTIONS OF LENGTH TO DEPTH. Under 10. Sheerstrake for ½ length amidships.	Under 10. Strake below Sheerstrake for ½ length amidships.	Under 10. Stringer Angle for ½ length amidships.	Under 10. Stringer Plate for ½ length amidships.	Under 10. Deck Plating for ½ length amidships.	10 and under 11. Sheerstrake for ½ length amidships.	10 and under 11. Strake below Sheerstrake for ½ length amidships.	10 and under 11. Stringer Angle for ½ length amidships.	10 and under 11. Stringer Plate for ½ length amidships.	10 and under 11. Deck Plating for ½ length amidships.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
29900 and under 31300	46	·62	·62	4½ × 4½ ·58	51 × ·52	·36	·66	·62	4½ × 4½ × ·58	53 × ·54	·38
31300 „ 32700	47	·64	„	„ „ „	52 „	„	·68	„	5 × 5 „	54 „	„
32700 „ 34100	„	„	·64	„ „ ·60	53 „	·38	„	·64	„ „ ·60	55 „	·40
34100 „ 35500	„	·66	„	5 × 5 „	54 „	„	·70	„	„ „ „	56 × ·56	„
35500 „ 36900	48	„	„	„ „ ·62	55 „	·40	„	·66	„ „ ·62	57 „	„
36900 „ 38300	„	·68	·66	„ „ „	56 × ·54	„	·72	„	„ „ „	58 „	·42
38300 „ 39700	„	„	„	„ „ ·64	57 „	„	„	·68	„ „ ·64	59 „	„
39700 „ 41100	49	·70	·68	„ „ „	58 „	·42	·74	„	„ „ „	60 × ·58	„
41100 „ 42500	„	„	„	„ „ „	59 „	„	„	·70	„ „ „	61 „	·44
42500 „ 43900	„	·72	„	„ „ „	60 „	„	·76	„	„ „ „	62 „	„
43900 „ 45300	50	„	·70	„ „ ·66	61 × ·56	·44	„	·72	„ „ ·66	63 „	„
45300 „ 46700	„	·74	„	„ „ „	62 „	„	·78	„	„ „ „	64 × ·60	·46
46700 „ 48100	„	„	·72	„ „ ·68	63 „	„	„	·74	„ „ ·68	65 „	„
48100 „ 49500	51	·76	„	„ „ „	64 „	·46	·80	„	„ „ „	66 „	„
49500 „ 50900	„	„	„	„ „ ·70	65 × ·58	„	·82	·76	„ „ ·70	2 at 48 × ·62	·48
50900 „ 52300	„	·78	·74	„ „ „	66 „	„	„	„	„ „ „	„ „ „	„
52300 „ 53700	52	„	„	„ „ ·72	2 at 48 „	·48	·84	·78	„ „ ·72	„ 49 „	„
53700 „ 55100	„	·80	·76	„ „ „	„ „ ·60	„	·86	„	„ „ „	„ „ ·64	·50
55100 „ 56500	„	„	„	„ „ „	„ 49 „	„	„	·80	6 × 6 „	„ 50 „	„
56500 „ 57900	53	·82	„	„ „ „	„ „ ·62	·50	·88	„	„ „ „	„ „ ·66	„
57900 „ 59300	„	„	·78	„ „ ·74	„ 50 „	„	·90	·82	„ „ ·74	„ 51 „	·52
59300 „ 60700	„	·84	„	6 × 6 „	„ „ ·64	„	„	„	„ „ „	„ „ ·68	„
60700 „ 62100	54	„	·80	„ „ ·76	„ 51 „	·52	·92	·84	„ „ ·76	„ 52 „	·54
62100 „ 63500	„	·86	„	„ „ „	„ „ ·66	„	·94	„	„ „ „	„ „ ·70	·56
63500 „ 64900	„	„	„	„ „ ·78	„ 52 „	·54	„	·86	„ „ ·78	„ 53 „	„
64900 „ 66300	55	·88	·82	„ „ „	„ „ ·68	·56	·96	„	„ „ „	„ „ ·72	·58
66300 „ 67700	„	„	„	„ „ ·80	„ 53 „	„	·98	·88	„ „ ·80	„ 54 „	·60
67700 „ 69100	„	·90	·84	„ „ „	„ „ ·70	·58	„	„	7 × 7 „	„ „ ·74	„
69100 „ 70500	56	„	„	„ „ „	„ 54 „	·60	1·00	·90	„ „ „	„ 55 „	·62
70500 „ 71900	„	·92	„	„ „ „	„ „ ·72	„	1·02	„	„ „ „	„ „ ·76	·64
71900 „ 73300	„	·94	·86	„ „ ·82	„ 55 „	·62	„	·92	„ „ ·82	„ 56 „	„
73300 „ 74700	57	„	„	„ „ „	„ „ ·74	·64	1·04	„	„ „ „	„ „ ·78	·66
74700 „ 76100	„	·96	·88	„ „ ·84	„ 56 „	„	1·06	·94	„ „ ·84	„ 57 „	·68
76100 „ 77500	„	·98	„	7 × 7 „	„ „ ·76	·66	„	„	8 × 8 „	„ „ ·80	„
77500 „ 78900	58	„	„	„ „ ·86	„ 57 „	·68	1·08	·96	„ „ ·86	„ 58 „	·70
78900 „ 80300	„	1·00	·90	„ „ „	„ „ ·78	„	1·10	„	„ „ „	„ „ ·82	·72
80300 „ 81700	„	1·02	„	„ „ „	„ 58 „	·70	„	·98	„ „ „	„ 59 „	„

The topside scantlings and decks before and abaft a bridge are to be determined by the vessel's proportions taken to the upper deck. These scantlings are to be maintained throughout the length of a "short" bridge, and are to be extended within the ends of a "long" bridge for a distance equal to one-third the breadth of the vessel.

The upper deck stringer angles in the above Table may be gradually reduced at the ends of the vessel to the size given in Table 17 for upper deck stringer angles at ends in way of erections.

TOPSIDE PLATING, DECK and STRINGER PLATES at UPPER, AWNING or SHELTER DECKS, and "LONG" BRIDGES.

TABLE 18.

(See Continuation.)

LONGITUDINAL NUMBER. L×(B+D).	PROPORTIONS OF LENGTH TO DEPTH. 11 and under 12.					12 and under 13.				
	Sheerstrake for ½ length amidships.	Strake below Sheerstrake for ½ length amidships.	Stringer Angle for ½ length amidships.	Stringer Plate for ½ length amidships.	Tie Plates and Deck Plating for ½ length amidships.	Sheerstrake for ½ length amidships.	Strake below Sheerstrake for ½ length amidships.	Stringer Angle for ½ length amidships.	Stringer Plate for ½ length amidships.	Tie Plates and Deck Plating for ½ length amidships.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
1400 and under 1650	·28	·24	2½ × 2½ × ·24	18 × ·24	5 × ·24	·30	·24	2½ × 2½ × ·28	20 × ·26	5 × ·26
1650 „ 1900	·30	„	„ „ „	19 „	6 „	·32	„	3 × 3 „	21 „	6 „
1900 „ 2150	„	·26	„ „ ·26	20 × ·26	„ ·26	„	·26	„ „ ·30	22 × ·28	„ ·28
2150 „ 2400	·32	„	3 × 3 „	21 „	„ „	·34	„	„ „ „	23 „	„ „
2400 „ 2650	„	·28	„ „ ·28	22 × ·28	„ ·28	·36	·28	„ „ ·32	24 × ·30	„ ·30
2650 „ 2900	·34	„	„ „ „	23 „	„ „	·38	„	„ „ „	25 „	„ „
2900 „ 3150	„	·30	„ „ ·30	24 × ·30	„ ·30	„	·30	„ „ ·34	26 × ·32	„ ·32
3150 „ 3500	·36	„	„ „ „	25 „	7 „	·40	„	„ „ „	27 „	7 „
3500 „ 3850	„	·32	„ „ ·32	26 × ·32	„ ·32	„	·32	„ „ ·36	28 × ·34	„ ·34
3850 „ 4200	·38	„	„ „ „	27 „	„ „	·42	„	„ „ „	29 „	„ „
4200 „ 4600	·40	·34	„ „ ·34	28 × ·34	„ ·34	„	·34	„ „ ·38	30 × ·36	8 × ·36
4600 „ 5000	„	„	„ „ „	29 „	8 „	·44	„	„ „ „	31 „	„ „
5000 „ 5400	·42	·36	„ „ ·36	30 × ·36	„ ·36	·46	·36	„ „ ·40	32 × ·38	„ ·38
5400 „ 5800	·44	„	„ „ „	32 „	„ „	„	„	„ „ „	34 „	9 „
5800 „ 6300	„	·38	„ „ ·38	34 × ·38	„ ·38	·48	·38	3½ × 3½ × ·42	36 × ·40	„ ·40
6300 „ 6800	·46	„	„ „ „	36 „	9 „	·50	„	„ „ „	38 „	10 „
6800 „ 7300	„	·40	„ „ ·40	38 × ·40	„ ·40	„	·40	„ „ ·44	40 × ·42	„ ·42
7300 „ 7900	·48	„	3½ × 3½ „	40 „	10 „	·52	·42	„ „ „	42 „	11 „
7900 „ 8500	„	·42	„ „ ·42	42 × ·42	11 × ·42	„	„	„ „ „	44 × ·44	„ ·44
8500 „ 9200	·50	„	„ „ „	44 „	„ „	·54	·44	„ „ ·46	46 „	12 „
9200 „ 9900	·52	·44	„ „ ·44	46 × ·44	12 × ·44	·56	„	„ „ „	48 × ·46	„ ·46
9900 „ 10600	„	„	„ „ „	48 „	„ „	„	·46	„ „ ·48	50 „	13 „
10600 „ 11400	·54	·46	„ „ ·46	50 × ·46	13 × ·46	·58	„	4 × 4 „	52 × ·48	„ ·48
11400 „ 12200	„	„	4 × 4 „	52 „	„ „	·60	·48	„ „ ·50	54 × ·50	14 × ·50
12200 „ 13100	·56	·48	„ „ ·48	54 × ·48	14 × ·48	·62	„	„ „ „	43 „	Dk·30 for ½L.
13100 „ 14100	·58	„	„ „ „	56 „	„ „	·64	·50	„ „ ·52	44 × ·52	„ „
14100 „ 15200	„	·50	„ „ „	43 × ·50	Dk·30 for ½L.	„	·52	„ „ „	45 „	„ „
15200 „ 16400	·60	„	4½ × 4½ „	44 „	„ „	·66	„	4½ × 4½ „	46 „	Cmpl.·30 deck
16400 „ 17600	·62	·52	„ „ ·50	45 „	„ „	·68	·54	„ „ ·54	47 × ·54	·32
17600 „ 18800	„	„	„ „ „	46 × ·52	Cmpl.·30 deck.	·70	„	„ „ „	48 „	„
18800 „ 20100	·64	·54	„ „ ·52	47 „	·32	·72	·56	„ „ ·56	49 „	·34
20100 „ 21500	·66	„	„ „ „	48 „	„	·74	„	„ „ „	50 × ·56	„
21500 „ 22900	„	·56	„ „ ·54	49 „	·34	·76	·58	„ „ ·58	51 „	·36
22900 „ 24300	·68	·58	„ „ „	50 × ·54	„	„	·60	„ „ ·60	52 „	„
24300 „ 25700	„	„	„ „ ·56	51 „	·36	·78	„	„ „ „	53 × ·58	·38
25700 „ 27100	·70	·60	„ „ „	52 „	„	·80	·62	„ „ ·62	54 „	„
27100 „ 28500	·72	·62	„ „ „	53 „	·38	·82	·64	„ „ „	55 „	·40
28500 „ 29900	„	„	„ „ „	54 × ·56	„	·84	·66	5 × 5 × ·64	56 × ·60	„

The topside scantlings and decks before and abaft a bridge are to be determined by the vessel's proportions taken to the upper deck. These scantlings are to be maintained throughout the length of a "short" bridge, and are to be extended within the ends of a "long" bridge for a distance equal to one-third the breadth of the vessel.

The upper deck stringer angles in the above Table may be gradually reduced at the ends of the vessel to the size given in Table 17 for upper deck stringer angles at ends in way of erections

TOPSIDE PLATING, DECK and STRINGER PLATES at UPPER, AWNING or SHELTER DECKS, and "LONG" BRIDGES.

TABLE 18.

(See Continuation.)

LONGITUDINAL NUMBER. L × (B + D).	PROPORTIONS OF LENGTH TO DEPTH.									
	11 and under 12.					12 and under 13.				
	Sheerstrake for ½ length amidships.	Strake below Sheerstrake for ½ length amidships.	Stringer Angle for ½ length Amidships.	Stringer Plate for ½ length amidships.	Deck Plating for ½ length amidships.	Sheerstrake for ½ length amidships.	Strake below Sheerstrake for ½ length amidships.	Stringer Angle for ½ length amidships.	Stringer Plate for ½ length amidships.	Deck Plating for ½ length amidships.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
29900 and under 31300	·74	·64	5 × 5 × ·58	55 × ·56	·40	·86	·68	5 × 5 × ·64	57 × ·60	·42
31300 „ 32700	·76	·66	„ „ „	56 „	„	·88	·70	„ „ ·66	58 „	„
32700 „ 34100	„	„	„ „ ·60	57 × ·58	„	„	·72	„ „ „	59 × ·62	„
34100 „ 35500	·78	·68	„ „ „	58 „	·42	·90	·74	„ „ ·68	60 „	·44
35500 „ 36900	„	·70	„ „ ·62	59 „	„	·92	„	„ „ ·70	61 „	„
36900 „ 38300	·80	„	„ „ „	60 × ·60	„	„	·76	„ „ „	62 × ·64	„
38300 „ 39700	·82	·72	„ „ ·64	61 „	·44	·94	·78	„ „ ·72	63 „	·46
39700 „ 41100	„	·74	„ „ „	62 „	„	·96	·80	„ „ „	64 „	„
41100 „ 42500	·84	„	„ „ „	63 × ·62	„	„	„	„ „ ·74	65 × ·66	„
42500 „ 43900	·86	·76	„ „ „	64 „	·46	·98	·82	„ „ „	66 „	·48
43900 „ 45300	„	·78	„ „ ·66	65 „	„	1·00	·84	„ „ ·76	2 at 48 ·68	„
45300 „ 46700	·88	„	„ „ „	66 × ·64	„	1·02	·86	„ „ „	„ „ ·70	„
46700 „ 48100	·90	·80	„ „ ·68	2 at 48 „	·48	1·04	·88	6 × 6 „	„ 49 „	·50
48100 „ 49500	„	·82	„ „ „	„ „ ·66	„	„	·90	„ „ ·78	„ „ ·72	„
49500 „ 50900	·92	„	„ „ ·70	„ 49 „	„	1·06	·92	„ „ „	„ 50 „	„
50900 „ 52300	·94	·84	6 × 6 „	„ „ ·68	·50	1·08	·94	„ „ „	„ „ ·74	·52
52300 „ 53700	„	·86	„ „ ·72	„ 50 „	„	„	·96	„ „ ·80	„ 51 „	„
53700 „ 55100	·96	„	„ „ „	„ „ ·70	·52	1·10	·98	„ „ „	„ „ ·76	„
55100 „ 56500	·98	·88	„ „ „	„ 51 „	„	1·12	1·00	„ „ „	„ 52 „	·54
56500 „ 57900	„	·90	„ „ „	„ „ ·72	·54	„	1·02	„ „ ·82	„ „ ·78	„
57900 „ 59300	1·00	„	„ „ ·74	„ 52 „	„	1·14	1·04	„ „ „	„ 53 „	·56
59300 „ 60700	1·02	·92	„ „ „	„ „ ·74	·56	1·16	1·06	7 × 7 „	„ „ ·80	„
60700 „ 62100	1·04	·94	„ „ ·76	„ 53 „	„	1·18	1·08	„ „ ·84	„ 54 „	·58
62100 „ 63500	1·06	„	7 × 7 „	„ „ ·76	·58	1·20	1·10	„ „ „	„ „ ·82	„
63500 „ 64900	„	·96	„ „ ·78	„ 54 × ·78	„	·90 Dbld	·86	„ „ „	„ 55 × ·84	·60
64900 „ 66300	1·08	·98	„ „ „	„ „ „	·60	·92 „	·88	„ „ „	„ „ „	·62
66300 „ 67700	1·10	„	„ „ ·80	„ 55 × ·80	„	„ „	·90	„ „ „	„ 56 × ·86	„
67700 „ 69100	„	1·00	„ „ „	„ „ ·82	·62	·94 „	„	„ „ ·86	„ „ ·88	·64
69100 „ 70500	1·12	1·02	„ „ „	„ 56 „	·64	·96 „	·92	8 × 8 „	„ 57 „	·66
70500 „ 71900	1·14	„	„ „ „	„ „ ·84	„	„ „	·94	„ „ ·88	„ „ ·90	„
71900 „ 73300	„	1·04	„ „ ·82	„ 57 × ·86	·66	·98 „	„	„ „ „	„ 58 × ·92	·68
73300 „ 74700	1·16	1·06	8 × 8 „	„ „ „	·68	1·00 „	·96	„ „ ·90	„ „ „	·70
74700 „ 76100	1·18	„	„ „ ·84	„ 58 × ·88	„	„ „	·98	„ „ „	„ 59 × ·94	·72
76100 „ 77500	„	1·08	„ „ „	„ „ ·90	·70	1·02 „	„	„ „ ·92	„ „ ·96	„
77500 „ 78900	1·20	1·10	„ „ ·86	„ 59 „	·72	1·04 „	1·00	„ „ „	„ 60 „	·74
78900 „ 80300	·90 Dbld	·90	„ „ „	„ „ ·92	„	„ „	1·02	„ „ ·94	„ „ ·98	„
80300 „ 81700	·92 „	„	„ „ „	„ 60 × ·94	·74	1·06 „	„	„ „ „	„ 61 × 1·00	·76

The topside scantlings and decks before and abaft a bridge are to be determined by the vessel's proportions taken to the upper deck. These scantlings are to be maintained throughout the length of a "short" bridge, and are to be extended within the ends of a "long" bridge for a distance equal to one-third the breadth of the vessel.

The upper deck stringer angles in the above Table may be gradually reduced at the ends of the vessel to the size given in Table 17 for upper deck stringer angles at ends in way of erections.

TOPSIDE PLATING, DECK and STRINGER PLATES at UPPER, AWNING or SHELTER DECKS, and "LONG" BRIDGES.

TABLE 18.

(See Continuation.)

LONGITUDINAL NUMBER. L × (B + D).	PROPORTIONS OF LENGTH TO DEPTH. 13 and under 14. Sheerstrake for ½ length amidships.	Strake below Sheerstrake for ½ length amidships.	Stringer Angle for ½ length amidships.	Stringer Plate for ½ length amidships.	Tie Plates and Deck Plating for ½ length amidships.	THICKNESS OF UPPER DECK UNDER "LONG" BRIDGES. Stringer Plate.	Tie Plates and Deck Plating.	THICKNESS OF SHEERSTRAKE AND STRAKE BELOW AT ENDS.	BEAM STRINGERS AT ENDS OF UPPER, AWNING OR SHELTER DECKS, ALSO THICKNESS OF TIE PLATES AT ENDS.	THICKNESS OF DECK PLATING AT ENDS OF UPPER, AWNING OR SHELTER DECKS.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
1400 and under 1650	·32	·24	3 × 3 × ·32	22 × ·28	6 × ·28	·22	·22	·24	10 × ·22	
1650 „ 1900	·34	„	„ „ „	23 „	„ „	„	„	„	11 „	
1900 „ 2150	·36	·26	„ „ ·34	24 × ·30	„ ·30	·24	·24	„	„ ·24	
2150 „ 2400	·38	„	„ „ „	25 „	„ „	„	„	„	„ „	
2400 „ 2650	·40	·28	„ „ ·36	26 × ·32	„ ·32	„	„	·26	12 „	
2650 „ 2900	„	„	„ „ „	27 „	„ „	·26	·26	„	„ ·26	
2900 „ 3150	·42	·30	„ „ ·38	28 × ·34	7 × ·34	„	„	„	„ „	
3150 „ 3500	·44	„	„ „ „	29 „	„ „	„	„	„	13 „	
3500 „ 3850	„	·32	„ „ ·40	30 × ·36	„ ·36	·28	·28	·28	„ ·28	
3850 „ 4200	·46	„	„ „ „	31 „	„ „	„	„	„	„ „	
4200 „ 4600	·48	·34	3½ × 3½ × ·42	32 × ·38	8 × ·38	„	„	·30	14 „	
4600 „ 5000	„	·36	„ „ „	33 „	„ „	·30	·30	„	„ ·30	
5000 „ 5400	·50	„	„ „ ·44	34 × ·40	9 × ·40	„	„	·32	„ „	
5400 „ 5800	·52	·38	„ „ „	36 „	„ „	„	„	„	15 „	
5800 „ 6300	„	·40	„ „ ·46	38 × ·42	10 × ·42	·32	·32	·34	„ ·32	
6300 „ 6800	·54	„	„ „ „	40 „	„ „	„	„	„	16 „	
6800 „ 7300	·56	·42	„ „ ·48	42 × ·44	11 × ·44	„	„	·36	„ „	
7300 „ 7900	„	·44	„ „ „	44 „	„ „	·34	·34	„	17 „	
7900 „ 8500	·58	„	„ „ ·50	46 × ·46	12 × ·46	„	„	„	„ „	
8500 „ 9200	·60	·46	„ „ „	48 „	„ „	„	„	„	18 × ·34	
9200 „ 9900	·62	·48	4 × 4 × ·52	50 × ·48	13 × ·48	·36	·36	·38	19 „	
9900 „ 10600	·64	„	„ „ „	42 × ·48	Dk·30 for ½L.	·36	Dk. ·30 pltg	„	20 „	
10600 „ 11400	·66	·50	„ „ ·54	43 × ·50	„ „	·38	„	„	21 „	
11400 „ 12200	·68	·52	„ „ „	44 „	„ „	·40	„	„	22 × ·36	
12200 „ 13100	·70	·54	„ „ ·56	45 × ·52	Cmpl·30 deck	·42	„	·40	23 „	·30
13100 „ 14100	·72	„	4½ × 4½ „	46 „	„	·44	„	„	24 „	„
14100 „ 15200	·74	·56	„ „ ·58	47 × ·54	·32	„	„	„	25 „	„
15200 „ 16400	·76	·58	„ „ „	48 „	·34	„	„	„	26 × ·38	„
16400 „ 17600	·78	·60	„ „ ·60	49 × ·56	·36	„	„	„	27 „	„
17600 „ 18800	·80	„	„ „ „	50 „	·38	„	„	„	28 „	„
18800 „ 20100	·82	·62	„ „ „	51 × ·58	„	·46	„	·42	29 „	„
20100 „ 21500	·84	·64	„ „ ·62	52 „	·40	„	„	„	30 × ·40	„
21500 „ 22900	·86	·66	„ „ „	53 × ·60	„	„	„	„	31 „	„
22900 „ 24300	·88	„	„ „ ·64	54 „	„	„	„	„	32 „	„
24300 „ 25700	·90	·68	„ „ „	55 × ·62	·42	„	·32	·44	„ „	·32
25700 „ 27100	·92	·70	„ „ ·66	56 „	„	„	„	„	33 × ·42	„
27100 „ 28500	·94	·72	5 × 5 „	57 × ·64	„	„	·34	„	„ „	„
28500 „ 29900	·96	·74	„ „ „	58 „	·44	„	„	„	34 „	„

The topside scantlings and decks before and abaft a bridge are to be determined by the vessel's proportions taken to the upper deck. These scantlings are to be maintained throughout the length of a "short" bridge, and are to be extended within the ends of a "long" bridge for a distance equal to one-third the breadth of the vessel.

The upper deck stringer angles in the above Table may be gradually reduced at the ends of the vessel to the size given in Table 17 for upper deck stringer angles at ends in way of erections.

TOPSIDE PLATING, DECK and STRINGER PLATES at UPPER, AWNING or SHELTER DECKS, and "LONG" BRIDGES.

TABLE 18.

(Concluded.)

LONGITUDINAL NUMBER. L × (B + D).	PROPORTIONS OF LENGTH TO DEPTH. 13 and under 14. Sheerstrake for ½ length amidships.	Strake below Sheerstrake for ½ length amidships.	Stringer Angle for ½ length amidships.	Stringer Plate for ½ length amidships.	Deck Plating for ½ length amidships.	THICKNESS OF UPPER DECK UNDER "LONG" BRIDGES. Stringer Plates.	Deck Plating.	THICKNESS OF SHEERSTRAKE AND STRAKE BELOW AT ENDS.	BEAM STRINGERS AT ENDS OF UPPER, AWNING OR SHELTER DECKS, ALSO THICKNESS OF TIE PLATES AT ENDS.	THICKNESS OF DECK PLATING AT ENDS OF UPPER AWNING OR SHELTER DECKS.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
29900 and under 31300	·98	·76	5 × 5 ·68	59 × ·64	·44	·48	·36	·44	34 × ·42	·34
31300 " 32700	1·00	·78	" " "	60 × ·66	"	"	"	"	35 × ·44	"
32700 " 34100	1·02	·80	" " ·70	61 "	·46	"	"	·46	" "	"
34100 " 35500	1·04	·82	" " "	62 "	"	"	·38	"	36 "	"
35500 " 36900	1·06	·84	" " "	63 × ·68	"	"	"	"	" "	·36
36900 " 38300	1·08	·86	" " ·72	64 "	"	"	"	"	37 "	"
38300 " 39700	1·10	·88	" " "	65 "	·48	"	·40	"	" "	"
39700 " 41100	1·12	·90	" " "	66 × ·70	"	·50	"	·48	" "	"
41100 " 42500	1·14	·92	" " ·74	2 at 48 × ·72	"	"	"	"	38 "	"
42500 " 43900	1·16	·94	6 × 6 "	" " ·74	·50	"	"	"	" "	"
43900 " 45300	1·18	·96	" " "	" 49 "	"	"	·42	"	" "	"
45300 " 46700	1·20	·98	" " ·76	" " ·76	"	"	"	"	39 "	"
46700 " 48100	·90 Dbld.	·82	" " "	" 50 "	·52	"	"	·50	" "	"
48100 " 49500	" "	"	" " "	" " ·78	"	·52	"	"	" ·46	"
49500 " 50900	·92	·84	" " ·78	" 51 "	"	"	"	"	40 "	"
50900 " 52300	" "	·86	" " "	" " ·80	·54	"	"	"	" "	"
52300 " 53700	·94 "	"	" " ·80	" 52 "	"	"	·44	"	" "	"
53700 " 55100	·96 "	·88	" " "	" " ·82	·56	"	"	·52	41 "	·38
55100 " 56500	" "	·90	7 × 7 "	" 53 "	"	"	"	"	" "	"
56500 " 57900	·98 "	"	" " ·82	" " ·84	·58	·54	"	"	" "	"
57900 " 59300	1·00 "	·92	" " "	" 54 "	"	"	·46	"	42 "	"
59300 " 60700	" "	·94	" " "	" " ·86	·60	"	"	"	" "	"
60700 " 62100	1·02 "	"	" " ·84	" 55 "	·62	"	"	·54	" "	"
62100 " 63500	1·04 "	·96	" " "	" " ·88	"	"	"	"	43 × ·48	"
63500 " 64900	" "	·98	" " ·86	" 56 × ·90	·64	"	·48	"	" "	"
64900 " 66300	1·06 "	"	" " "	" " "	·66	·56	"	·56	" "	"
66300 " 67700	1·08 "	1·00	8 × 8 "	" 57 × ·92	"	"	"	"	44 "	"
67700 " 69100	" "	1·02	" " ·88	" " ·94	·68	"	·50	"	" "	"
69100 " 70500	1·10 "	"	" " "	" 58 "	·70	"	"	"	" "	"
70500 " 71900	1·12 "	1·04	" " "	" " ·96	"	·58	"	"	45 "	·40
71900 " 73300	" "	1·06	" " ·90	" 59 × ·98	·72	"	·52	·58	" ·50	"
73300 " 74700	1·14 "	"	" " "	" " "	·74	"	"	"	" "	"
74700 " 76100	1·16 "	1·08	" " "	" 60 × 1·00	"	·60	"	"	" "	"
76100 " 77500	" "	1·10	" " ·92	" " 1·02	·76	"	·54	"	46 "	"
77500 " 78900	1·18 "	"	" " "	" 61 "	·78	"	"	"	" "	"
78900 " 80300	1·20 "	1·12	" " "	" " 1·04	"	·62	"	·60	" "	"
80300 " 81700	" "	1·14	" " ·94	" 62 × 1·06	·80	"	·56	"	" "	"

The topside scantlings and decks before and abaft a bridge are to be determined by the vessel's proportions taken to the upper deck. These scantlings are to be maintained throughout the length of a "short" bridge, and are to be extended within the ends of a "long" bridge for a distance equal to one-third the breadth of the vessel.

The upper deck stringer angles in the above Table may be gradually reduced at the ends of the vessel to the size given in Table 17 for upper deck stringer angles at ends in way of erections.

Diameters and spacing of RIVETS and breadths of BUTT STRAPS, BUTT LAPS, and EDGE LAPS.

BUTT STRAPS. TABLE 19.

		inches.	inches.	inches.	inches.	inches.	inches.
Thickness of Plates		·22 and under ·34	·34 and under ·48	·48 and under ·66	·66 and under ·88	·88 and under 1·14	1·14 to 1·20
Diameter of Rivets		5/8	3/4	7/8	1	1 1/8	1 1/4
Breadth of Quadruple riveted Butt Straps in inches		...	...	22	25	28 1/4	31 1/2
Breadth of Treble riveted Butt Straps in inches		...	14 1/4	16 3/4	19	21 1/2	24
Breadth of Double riveted Butt Straps in inches		8	9 3/4	11 1/4	...	...	...
Breadth of Single riveted Butt Straps in inches		4 1/2	5 1/4	...	...	...	...
Breadth of Quadruple riveted Butt Laps in inches		...	...	12	14	16	18
Breadth of Treble riveted Butt Laps in inches		...	7 1/2	9	10 1/2	12	13 1/2
Breadth of Double riveted Butt Laps in inches		4 1/4	5	6	...	...	...
Breadth of Single riveted Butt Laps in inches		2 1/2	3	...	...	...	...
Breadth of Treble riveted Edge Laps in inches		...	...	...	8 1/2	9 1/2	10 1/2
Breadth of Double riveted Edge Laps in inches		3 3/4	4 1/2	5 1/4	6	6 3/4	7 1/2
Breadth of Single riveted Edge Laps in inches		2 1/4	2 1/2	3	...	...	...
MAXIMUM SPACING FROM CENTRE TO CENTRE. 3½ diam. c. to c.	In † Butts of Outside Plating, and all Beam Stringer Plates (except quadruple riveted butt laps)	2 1/4	2 5/8	3 1/8	3 1/2	4	4 3/8
4 diam. c. to c.	In Edges of Outside Plating (forward and aft) Quadruple Riveted Butt Laps and Double Butt Straps; Butts of Deck Plating, Butts of Margin Plates, Girders, Tie Plates, and Floor Plates; also Butts and Edges of Inner Bottom Plating ...	2 1/2	3	3 1/2	4	4 1/2	5
4½ diam. c. to c.	In Gunwale Angle Bars, Margin Plate Angles, Edges and Butts of Bulkhead Plating, Angles connecting Side Stringers to Web Frames and Edges of Deck Plating.	2 3/4	3 3/8	4	4 1/2	...	...
5 diam. c. to c.	In Flat Keel Angles, Vertical Angles connecting Floors and Centre Girder, Bulkhead Frames where caulked, Butts and Edges of Mast Plates, Floors and cross ties in after peak	3 1/8	3 3/4	4 3/8	5	5 5/8	6 1/4
6 diam. c. to c.	In Deck Plating to Beams where single flange beams are fitted at alternate frames	3 3/4	4 1/2	5 1/4	...	...	...
7 diam. c. to c.	In *Frames, Reversed Frames, Floors, Keelsons, Beam Angles, Deck and Hold Stringer Angles, Face Angles on Web Frames and Side Stringers, Bulkhead Stiffeners, Longitudinal Angles on continuous Girders, Vertical Angles connecting Floors and Side Girders, and Deck Plating to beams except where single flange beams are fitted at alternate frames...	4 1/2	5 1/4	6 1/4	7	...	...

Thickness of Plates.	Thickness of Butt Straps. Single.	Double. Strap which is Countersunk for Rivets.	Double. Strap on opposite side of Plate.	Thickness of Plates.	Thickness of Butt Straps. Single.	Double. Strap which is Countersunk for Rivets.	Double. Strap on opposite side of Plate.
inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
·22	·22			·72	·90	·52	·44
·24	·24			·74	·94	·54	”
·26	·26			·76	·96	·56	·46
·28	·28			·78	·98	·58	·48
·30	·30			·80	1·00	”	·50
·32	·34			·82	1·04	·60	”
·34	·38			·84	1·06	”	·52
·36	·40			·86	1·08	·62	”
·38	·44			·88	1·10	”	·54
·40	·48			·90	1·12	·64	·56
·42	·52			·92	1·16	”	·58
·44	·54	·34	·28	·94	1·18	·66	·60
·46	·58	·36	”	·96	1·20	”	·62
·48	·60	·38	·30	·98	1·22	·68	”
·50	·62	·40	”	1·00	1·24	”	·64
·52	·64	”	·32	1·02	1·28	·70	”
·54	·68	·42	”	1·04	1·30	”	·66
·56	·70	”	·34	1·06	1·32	·72	”
·58	·74	·44	”	1·08	1·34	”	·68
·60	·76	”	·36	1·10	1·38	·74	”
·62	·78	·46	”	1·12	1·40	”	·70
·64	·80	”	·38	1·14	1·44	·76	”
·66	·82	·48	·40	1·16	1·46	”	·72
·68	·86	”	·42	1·18	1·48	·78	”
·70	·88	·50	”	1·20	1·50	”	·74

† In butts connected by single butt straps alternate rivets may be omitted in the back row of treble riveting when the longitudinal number is 16,000 and under; when above this number, the rivets in the back row are not to be more than 5 to 5½ diameters apart from centre to centre. All overlapped butts are to have complete rows of rivets.

* The rivets attaching the outside plating to the frames are to be spaced not more than 6 diameters apart from centre to centre where the depth of framing is 11 inches and above, and throughout the vessel where the rule frame spacing is 26 inches and above. Where the framing consists of channel bars with reversed frames the rivets attaching the outside plating to the frames are to be spaced not more than 5½ diameters apart from centre to centre.

Where the framing is in accordance with the requirements of Table 2, the rivets attaching the reversed frames to the frames are to be spaced the same as the rivets through the frames and outside plating.

In deep water ballast tanks and in fore and after peak tanks, the rivets through the frames and outside plating are to be spaced not more than 5½ diameters apart from centre to centre.

Before the three-fifths lengths of a steamer having a tonnage co-efficient of ·76 or having a full form at the fore part, the rivets in the frames and plating forming the flat of the bottom are to be spaced not more than 5½ diameters apart from centre to centre.

Rivets to be ⅛ of an inch larger in diameter in the Stem, Stern Frame, and Keel, but in no case need these exceed 1¼ inches in diameter, and to be spaced 5 diameters apart from centre to centre. In single screw steamers above 350 feet in length, the after lengths of shell plating are to be connected to the portion of the stern frame below the boss with three rows of rivets.

For diameter and spacing of rivets in Rudders, see Table 24.

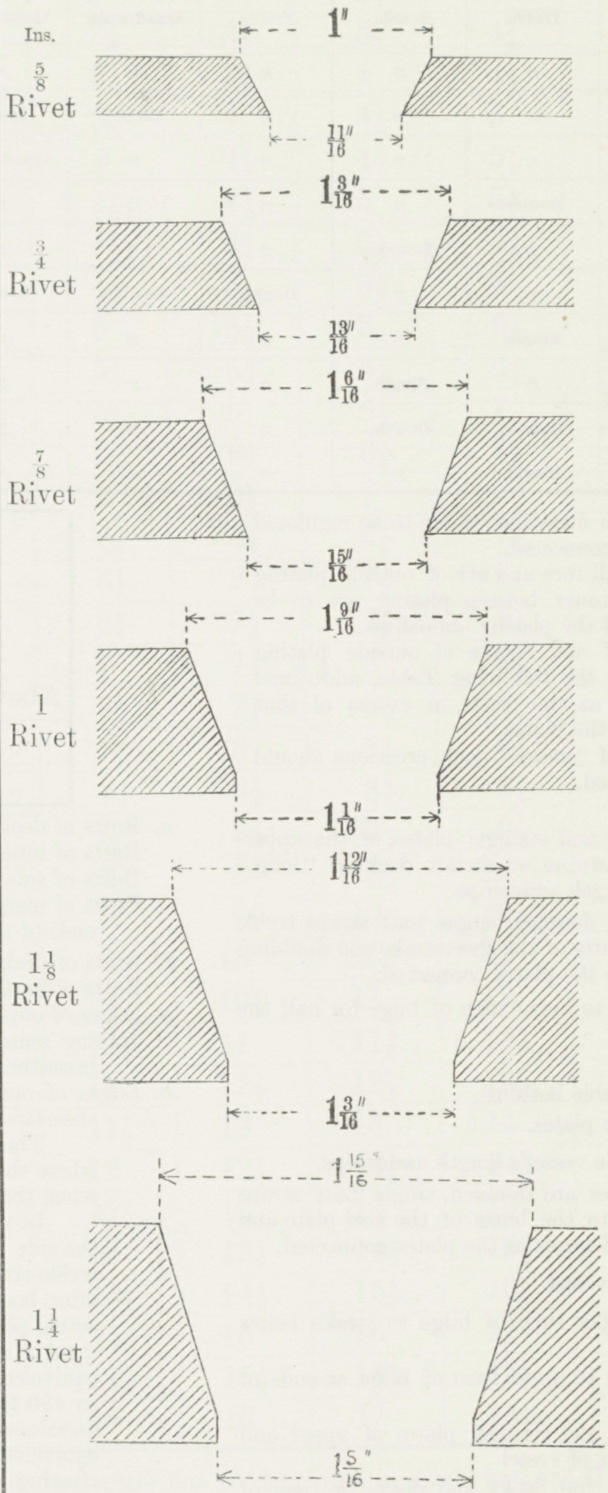
Lloyd's Register of British and Foreign Shipping, London.—
15th December, 1910.

TABLE 20.

NUMBER of RIVETS IN EDGES of Plating between Frames Amidships, excluding Rivets in Frames.

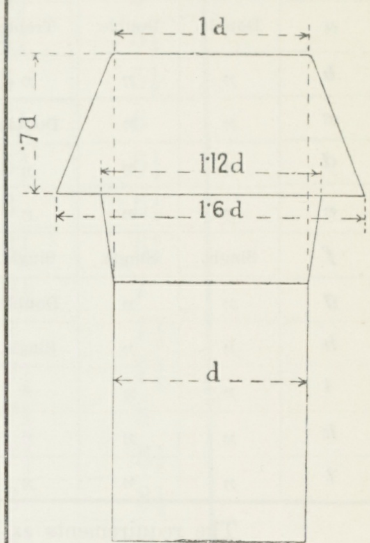
NUMBER OF RIVETS IN EACH ROW.						
Thickness of PLATES	ins. ·22 and under ·34	ins. ·34 and under ·48	ins. ·48 and under ·66	ins. ·66 and under ·88	ins. ·88 and under 1·14	ins. 1·14 to 1·20
Diameter of RIVETS	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$
Spacing of FRAMES 20 ins.	7	5	...	...	...	...
„ „ „ $20\frac{1}{2}$ „	7	6	...	...	...	...
„ „ „ 21 „	7	6	5	...	...	...
„ „ „ $21\frac{1}{2}$ „	...	6	5	...	...	...
„ „ „ 22 „	...	6	5	...	...	...
„ „ „ $22\frac{1}{2}$ „	...	6	5	...	...	...
„ „ „ 23 „	...	6	5	5	...	...
„ „ „ $23\frac{1}{2}$ „	...	7	6	5	...	...
„ „ „ 24 „	...	7	6	5	...	...
„ „ „ $24\frac{1}{2}$ „	...	...	6	5	...	...
„ „ „ 25 „	...	...	6	5	...	...
„ „ „ $25\frac{1}{2}$ „	...	...	7	6	...	...
„ „ „ 26 „	...	...	7	6	5	...
„ „ „ $26\frac{1}{2}$ „	...	...	7	6	5	...
„ „ „ 27 „	...	...	7	6	5	...
„ „ „ $27\frac{1}{2}$ „	...	...	7	6	6	...
„ „ „ 28 „	...	...	7	6	6	5
„ „ „ $28\frac{1}{2}$ „	...	...	8	7	6	5
„ „ „ 29 „	...	...	8	7	6	5
„ „ „ $29\frac{1}{2}$ „	...	...	8	7	6	5
„ „ „ 30 „	...	...	8	7	6	5
„ „ „ $30\frac{1}{2}$ „	...	...	...	7	6	6
„ „ „ 31 „	...	...	...	7	6	6
„ „ „ $31\frac{1}{2}$ „	...	...	...	8	7	6
„ „ „ 32 „	...	...	...	8	7	6
„ „ „ $32\frac{1}{2}$ „	...	...	...	8	7	6
„ „ „ 33 „	...	...	...	8	7	6

SIZE OF COUNTERSINK FOR RIVETS IN OUTSIDE PLATING.



The countersink is to extend through the whole thickness of the plate when less than ·60 of an inch in thickness; when ·60 of an inch or above, the countersink is to extend through nine-tenths the thickness of the plate.

FORM OF RIVET TO BE USED IN OUTSIDE PLATING.



The tapered neck of Rivet to be of suitable length in relation to the thickness of plate in which it is intended to be used.

In single riveted seams one frame rivet is to be fitted through the landing edges at each frame. In double riveted seams one frame rivet is to be fitted through the landing edges at each frame, except where the frames or the edges of the outside plating are joggled when two rivets are to be fitted. In treble riveted seams two frame rivets (the upper and lower) are to be fitted through the landing edges at each frame.

Where the fore and aft flange of the frame does not exceed 3 inches, the rivets attaching the outside plating thereto should not exceed $\frac{7}{8}$ inch in diameter, and where it is $3\frac{1}{2}$ inches wide, they should not exceed 1 inch in diameter.

There are to be at least four rivets in each flange of the angle bars between the frames, which connect the stringer plates and intercostal plates to the outside plating, where the frames are spaced less than 26 inches apart; where the spacing is 26 inches and less than 30 inches there are to be five rivets in each flange; and where the spacing is 30 inches and not more than 33 inches there are to be six rivets in each flange.

The rivets in the beam knees are to be in number and size as required by Section 20, paragraph 14.

The rivets in the vertical angles connecting floors and outside brackets to margin plates are to be in number and size as required by Table 9.

The rivets in the connecting straps for web frames and side stringers are to be in number and size as required by Table 5.

RIVETING of BUTTS and EDGES. TABLE 21.

	THICKNESS OF PLATES.											
	·22 and under ·30	·30 and under ·36	·36 and under ·42	·42 and under ·48	·48 and under ·54	·54 and under ·60	·60 and under ·68	·68 and under ·76	·76 and under ·84	·84 and under ·94	·94 and under 1·04	1·04 and under 1·20
a	Double.	Double.	Treble.	Treble.	Treble.	Treble.	Quadruple.	Quadruple.	Quadruple.	Double straps treble riveted.	Double straps treble riveted.	Double straps treble riveted.
b	"	"	"	"	"	"	"	"	"	Quadruple.	Quadruple.	"
c	"	"	Double.	"	"	"	Treble.	Treble.	"	"	"	Quadruple.
d	"	"	"	"	"	"	"	Quadruple.	"	"	"	
e	"	"	"	Double.	"	"	"	"	"	"	"	
f	Single.	Single.	Single.	"	Double.	"	"	"	"			
g	"	"	Double.	"	"	Double.	Double.	Double.	Double.	Double.	Double.	
h	"	"	Single.	Single.	"	"	"	"	"	Treble.	Treble.	
i	"	"	"	"	Single.	"	"	"	"			
k	"	"	"	Double.	Double.	"	"	"	"			
l	"	"	"	Single.	"	"	"	"				

The requirements as to attachments are to be regulated by the thicker of the plates connected.

The edge attachments all fore and aft of outside plating and middle line strake of inner bottom plating are to be regulated by the thickness of the plating amidships.

Where the breadth of any strake of outside plating exceeds the limits given in the following Table, additional riveting is to be provided at the butts in excess of that required by the thickness of the plates.

Butts of side plating of "short" deck erections should be not less than double riveted.

DEPTH (D) OF VESSEL.	MAXIMUM BREADTH OF STRAKE FOR RULE RIVETING.
Feet.	Inches.
Not exceeding 20	54
Above 20 and " " 24	60
" 24 " " " 28	66
" 28	72

a. Butts of sheerstrake, strake below and stringer plates, of the uppermost deck, whether upper, awning or shelter deck or "long" bridge, for half the vessel's length amidships.

Where the sheerstrake is doubled, single butt straps treble riveted are to be fitted to the butts of the sheerstrake and doubling plate, of the same thickness as the plates connected.

Butts of outside plating from keel to upper turn of bilge for half the vessel's length amidships.

Butts of boss plates.

Butts of centre girder plates in double bottoms.

Butts of floor plates and web frame plates.

b. Butts of flat keel plates for half the vessel's length amidships.

Where the flat keel plates are doubled, single butt straps treble riveted are to be fitted to the butts of the keel plate and doubling plate, of the same thickness as the plates connected.

c. Butts of flat keel plates at ends of vessel.

d. Butts of outside plating from upper turn of bilge to strake below sheerstrake.

Butts of outside plating from keel to upper turn of bilge at ends of vessel.

Butts of sheerstrake, strake below and stringer plates of upper and awning or shelter decks at ends of vessel.

Butts of beam stringer plates of 2nd decks and decks or tiers of beams below.

Butts of tie plates.

Butts of margin plates and middle line strake of double bottoms for half the vessel's length amidships.

Butts of vertical keelson plates, rider plates, and foundation plates.

e. Butts of deck plates for half the vessel's length amidships.

Butts of inner bottom plating for half the vessel's length amidships.

Butts of side girders in double bottoms.

Butts of margin plates and middle line strake of double bottoms at ends of vessel.

f. Butts of deck plates at ends of vessel.

Butts of inner bottom plating at ends of double bottoms.

g. Edges of outside plating from keel to upper turn of bilge.

Joining seams of stringer plates where the stringer is fitted in two breadths.

h. Edges of outside plating from upper turn of bilge to strake below sheerstrake.

The edges of sheerstrakes are to be double riveted except where the thickness of the side plating is ·84 of an inch or above, when they are to be treble riveted.

In vessels of 480 feet in length and where the thickness of the side plating is less than ·84 inch, the landing edges are to be treble riveted for one-fourth of the vessel's length in the fore and after bodies for a depth of one-third the depth of the vessel, the actual position of this treble riveting to depend upon the arrangement of shell plating and the special design of the vessel, or other equivalent strengthening to be afforded. Vessels of from 450 feet to 480 feet in length are to be additionally riveted at the before mentioned parts proportionately to their length, or to have other equivalent strengthening. Each case requiring this additional riveting of the seams is to be submitted for the approval of the Committee. Where the thickness of the side plating is ·84 inch or above, the edges are to be treble riveted for four-fifths of the vessel's length amidships.

i. Edges of deck plates.

k. Edges of middle line strake of inner bottom plating.

l. Edges of inner bottom plating except middle line strake.

DIAMETERS OF RUDDER HEADS. TABLE 22.

A × D*	Speed of vessel in knots per hour. ** Under 10	10 and under 12	12 and under 14	14 and under 16	16 and under 18	18 and under 20	20 and under 22
	Diameter of rudder head in inches.						
22 and under 28	2¾	3	3¼	3½	4	4½	5
28 and under 34	3	3¼	3½	3¾	4¼	4¾	5¼
34 and under 40	3¼	3½	3¾	4	4½	5	5½
40 and under 47	3½	3¾	4	4½	5	5½	6
47 and under 55	3¾	4	4¼	4¾	5¼	5¾	6¼
55 and under 64	4	4¼	4½	5	5½	6	6½
64 and under 73	4¼	4½	4¾	5¼	5¾	6¼	6¾
73 and under 83	4½	4¾	5	5½	6	6½	7
83 and under 94	4¾	5	5½	6	6½	7	7½
94 and under 105	5	5¼	5¾	6¼	6¾	7¼	7¾
105 and under 117	5¼	5½	6	6½	7	7½	8
117 and under 130	5½	5¾	6¼	6¾	7¼	7¾	8¼
130 and under 144	5¾	6	6½	7	7½	8	8½
144 and under 160	6	6¼	6¾	7¼	7¾	8¼	9
160 and under 176	6¼	6½	7	7½	8	8½	9¼
176 and under 192	6½	6¾	7¼	7¾	8¼	8¾	9½
192 and under 209	6¾	7	7½	8	8½	9¼	10
209 and under 227	7	7¼	7¾	8¼	8¾	9½	10¼
227 and under 246	7¼	7½	8	8½	9	9¾	10½
246 and under 268	7½	7¾	8¼	8¾	9¼	10	10¾
268 and under 290	7¾	8	8½	9	9½	10¼	11
290 and under 335	8	8½	9	9½	10	10½	11½
335 and under 390	8½	9	9½	10	10½	11½	12½
390 and under 445	9	9½	10	10½	11	12	13
445 and under 505	9½	10	10½	11	12	13	14
505 and under 570	10	10½	11	11½	12½	13½	14½
570 and under 640	10½	11	11½	12½	13½	14½	15½
640 and under 720	11	11½	12	13	14	15	16
720 and under 800	11½	12	12½	13½	14½	15½	16½
800 and under 890	12	12½	13	14	15	16	17
890 and under 980	12½	13	13½	14½	15½	16½	17½
980 and under 1080	13	13½	14½	15½	16½	17½	18½
1080 and under 1180	13½	14	15	16	17	18	19
1180 and under 1290	14	14½	15½	16½	17½	18½	19½
1290 and under 1400	14½	15	16	17	18	19	20

* A is the total rudder area abaft the centre line of the pintles in square feet, and D is the distance in feet of its centre of gravity abaft the centre line of the pintles.

** The diameters of rudder heads of sailing vessels are to be as required for vessels with a speed of less than 10 knots per hour.

Equipment for SAILING AND STEAM TRAWLERS AND TUGS.†

REGISTERED U.D. TONNAGE.		LONGITUDINAL NUMBER FOR IRON AND STEEL STEAM TRAWLERS AND TUGS.†	ANCHORS.						CHAIN (e) (h).								HAWSERS.		WARPS.	
			No.	Cwts. ex. Stock.		Cwts. Stockless. For Steamers only.		Cwts. ex. Stock.	Length.	Diameter	Minimum Weight.						Length.	Size.	Length.	Size.
											Stud Link.			Short Link.						
Sailing Trawlers.	Steam Trawlers and Tugs.†			1st Bower.	2nd Bower.	1st Bower.	2nd Bower.	Kedge.	Fathms.	Ins.	Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.	Fathms.	Ins.	Fathms.	Ins.
50 and under 65	65 and under 80	1980 and under 2250	3	3	3	$3\frac{3}{4}$	$3\frac{3}{4}$	$1\frac{3}{4}$	60	$\frac{12}{16}$	17	1	3	18	3	3	60	5	60	$2\frac{1}{2}$
65 ,, 80	80 ,, 100	2250 ,, 2620	3	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	2	60	$\frac{13}{16}$	20	1	11	22	0	11	60	$5\frac{1}{2}$	60	3
80 ,, 100	100 ,, 120	2620 ,, 2950	3	4	4	5	5	$2\frac{1}{4}$	60	$\frac{14}{16}$	23	1	17	25	1	17	60	$5\frac{1}{2}$	60	3
100 ,, 120	120 ,, 140	2950 ,, 3230	3	$4\frac{1}{4}$	4	$5\frac{1}{4}$	5	$2\frac{1}{2}$	60	$\frac{14}{16}$	23	1	17	25	1	17	60	$5\frac{1}{2}$	60	$3\frac{1}{2}$
120 ,, 140	140 ,, 160	3230 ,, 3510	3	$4\frac{1}{2}$	4	$5\frac{1}{2}$	5	$2\frac{1}{2}$	75	$\frac{15}{16}$	33	3	11	36	1	11	60	$5\frac{1}{2}$	60	$3\frac{1}{2}$
—	—	3510 ,, 3790	3	$4\frac{3}{4}$	$4\frac{1}{4}$	6	$5\frac{1}{4}$	$2\frac{1}{2}$	90	$\frac{15}{16}$	40	2	13	43	2	13	60	$5\frac{1}{2}$	60	4
—	—	3790 ,, 4040	3	5	$4\frac{1}{2}$	$6\frac{1}{4}$	$5\frac{1}{2}$	$2\frac{1}{2}$	90	1	45	3	17	49	2	0	60	$5\frac{1}{2}$	60	4
—	—	4040 ,, 4290	3	$5\frac{1}{4}$	$4\frac{3}{4}$	$6\frac{1}{2}$	6	$2\frac{1}{2}$	90	1	45	3	17	49	2	0	60	6	60	$4\frac{1}{2}$
—	—	4290 ,, 4530	3	$5\frac{1}{2}$	5	7	$6\frac{1}{4}$	$2\frac{3}{4}$	105	$1\frac{1}{16}$	60	2	18	64	3	12	60	6	60	$4\frac{1}{2}$
—	—	4530 ,, 4770	3	$5\frac{3}{4}$	$5\frac{1}{4}$	$7\frac{1}{4}$	$6\frac{1}{2}$	3	105	$1\frac{1}{16}$	60	2	18	64	3	12	60	6	60	5
—	—	4770 ,, 5010	3	6	$5\frac{1}{2}$	$7\frac{1}{2}$	7	3	120	$1\frac{2}{16}$	77	2	21	83	1	21	60	6	60	5
—	—	5010 ,, 5260	3	$6\frac{1}{4}$	$5\frac{3}{4}$	8	$7\frac{1}{4}$	$3\frac{1}{4}$	120	$1\frac{2}{16}$	77	2	21	83	1	21	60	6	60	5
—	—	5260 ,, 5570	3	$6\frac{1}{2}$	6	$8\frac{1}{4}$	$7\frac{1}{2}$	$3\frac{1}{4}$	120	$1\frac{2}{16}$	77	2	21	83	1	21	60	6	60	5
—	—	5570 ,, 5900	3	$6\frac{3}{4}$	$6\frac{1}{4}$	$8\frac{1}{2}$	8	$3\frac{1}{2}$	120	$1\frac{3}{16}$	86	3	12	93	0	12	60	7	60	5

† The equipment for Tug Steamers of a larger size than the Trawlers provided for by the above Table shall be the same as for ordinary seagoing vessels.

The Anchors and Chains to be tested at a Public Testing Machine in accordance with the statutory tests.

☼ The tests of Anchors in this Table are approximate tests ; or as near as can be expressed in tons and aliquot part of tons.

(**a**) By Section 50 of the Rules for the Building and Classification of Steel Vessels, it is provided that the equipment is to be regulated by the number produced by the sum of the measurements in feet of the greatest moulded breadth of the vessel and the depth from the upper part of keel to the top of the upper deck beams at side at the middle of the length multiplied by the length of the vessel. In awning or shelter deck and part awning deck vessels the measurement of depth defined above is to be taken to the deck next below the awning or shelter deck, provided the height between the decks does not exceed 8 feet. If the 'tween deck height exceeds 8 feet the measurement is to be taken to a point 8 feet below the awning or shelter deck. In turret deck vessels to the normal beam line at base of turret.

For a sailing vessel with a poop, bridge, top-gallant forecastle, or a raised quarter-deck, the equipment number is to be increased *one-fifteenth* beyond that which it would be if she were flush-decked.

For a steam vessel having erections on deck, the number obtained by the first clause of this paragraph is to be increased as follows :—

For a raised quarter deck, add the product of the height and length in feet of the erection.

For an awning or shelter deck, part awning deck, poop, bridge or forecastle add three-fourths the product of the height and length in feet of each erection, eight feet being taken as the maximum height for awning, or shelter deck, or part awning deck erections.

For deck houses or other erections not extending to the side, but exceeding either in length or breadth half the rule breadth of the vessel, add one-half the product of the height and length in feet of such erections.

Where erections are fitted upon erections, the equipment number is to be correspondingly increased.

To entitle vessels classed A "For Channel Purposes," to the Figure 1, the equipment of Anchors and Chain Cables, etc., should be as required by Table 31, with the exception that not more than two Bower Anchors and one Stream Anchor need be supplied, the first Bower Anchor should be of the full weight required by the Table, and the second Bower may be 15 per cent. lighter. This rule, however, applies only to vessels intended for short passages. In vessels classed "For Channel Purposes," which are intended for longer voyages, such as the Queenboro' and Flushing, the Channel Islands or the Irish Sea service, the equipment must be in accordance with the requirements of Table 31.

(**b**) In order to meet the requirements of different trades, the weight of Anchors as given in the Table may be modified as under :—

Where two Bower Anchors are required, one of them may be $7\frac{1}{2}$ per cent. lighter than the weight set forth in the Table, provided the collective weight of the two Anchors is equal to that given in the Table.

Where three Bower Anchors are required, one of them may be 15 per cent., and another $7\frac{1}{2}$ per cent. lighter than the weight set forth in the Table, provided the collective weight of the three Anchors is equal to that given in Table. Where it may be desired by the Owners the Bower Anchors may be of equal weight, provided the collective weight be not less than required by the Table.

For sailing vessels: in no case may the best Bower Anchor be lighter than prescribed in the Table, nor the third Bower be lighter than is allowed by this footnote.

All Anchor Stocks must be of acknowledged and approved description, and be one-fourth the weight of the Anchor given in the Table.

The heads of Stockless Anchors should not be less than three-fifths of the total weight of the Anchor.

(**c**) Stockless Stream and Kedge Anchors.—In the case of Stockless Stream and Kedge Anchors, an addition to the weight specified in this Table must be made of one-fourth to compensate for the deficiency in weight consequent on the absence of Stock.

(**d**) All Anchors, including Stream and Kedge Anchors exceeding 168lbs. in weight, including Stock, to be tested according to the requirements of the Act of Parliament and the Certificates of Test produced.

(**e**) The Chain Cables and Stream Chains to be tested in all cases according to the requirements of the Act of Parliament, and the Certificates of Test produced.

(**f**) There should be included in the weights, 2 End Shackles to each Cable ; that is 4 for each outfit, which contains two Cables.

(**g**) There should be included in the weights, 2 End Shackles to each Stream Chain

(**h**) Unstudded close-link Chains will be admitted as Cables, if proved *two-thirds* the Test required for Stud-link Chains for the *tensile* strain, and 100 per cent. above the *tensile* strain for the *breaking* strain.

(**i**) When steel wire Towlines or Hawsers are adopted, see notes (**i**) below.

Where a departure from the requirements of this Table is proposed by an Owner the same should be submitted in the first place for the consideration of the Committee.

N.B.—The Italic letters preceding the Equipment Numbers correspond with letters printed in the seventh column in the List of Steam Vessels in the Register Book to indicate the Equipment Numbers of vessels per this Table.

(i) STEEL WIRE TOWLINES, HAWSERS AND WARPS.

(**i**) When steel wire towlines, hawsers, or warps are adopted, a short length of each of the wires composing the towlines, &c., will be required, after being galvanized, to withstand a tensile stress equivalent to that set forth in Table 31, and the aggregate strength of the wires must not be less than 10 per cent. in excess of that stress.

Each wire will be required to be capable of being twisted around itself not less than eight times, and of being untwisted and straightened without breaking.

Each manufacturer to be required to provide on his premises machines suitable for satisfactorily making the foregoing tests, and the works to be at all times open to the inspection of the Society's Surveyors, who are to be empowered to retest any hawser or towline for which a certificate has been issued by the manufacturer.

Printed Forms of Certificates, approved by the Committee, to be given by the Manufacturers of Steel Wire Hawsers, will be supplied to them upon application to the Secretary.

SPECIAL FLEXIBLE STEEL WIRE ROPE.

When an Owner prefers to substitute special flexible steel wire ropes for steel wire rope of ordinary make, the sizes may be reduced in accordance with the following Table, provided each flexible rope be formed of six strands with 24 wires in each strand, and that the diameter of each wire is $\frac{1}{80}$th of the circumference of the rope, and the ropes are capable of withstanding the breaking tests shown in the Table :—

Flexible Steel Wire Rope. Size.	Flexible Steel Wire Rope. Breaking Test.	Corresponding Sizes required by Table 31.	Flexible Steel Wire Rope. Size.	Flexible Steel Wire Rope. Breaking Test.	Corresponding Sizes required by Table 31.
Inches.	Tons.	Inches.	Inches.	Tons.	Inches.
$1\frac{3}{4}$	8·9	2	$3\frac{1}{2}$	35·5	$4\frac{1}{4}$
2	11·7	$2\frac{1}{4}$	$3\frac{3}{4}$	41·0	$4\frac{1}{2}$
$2\frac{1}{2}$	18·2	$2\frac{3}{4}$	$4\frac{1}{4}$	52·5	$4\frac{3}{4}$
$2\frac{1}{2}$	18·2	3	$4\frac{1}{2}$	59·0	5
$2\frac{3}{4}$	22·0	$3\frac{1}{4}$	$4\frac{3}{4}$	65·5	$5\frac{1}{4}$
3	26·2	$3\frac{1}{2}$	5	73·0	$5\frac{1}{2}$
$3\frac{1}{4}$	30·7	$3\frac{3}{4}$	$5\frac{1}{2}$	88·0	6
$3\frac{1}{2}$	35·5	4	$6\frac{1}{4}$	114·0	7

RENEWAL OF CHAIN CABLES WHEN WORN.

When any length of a Chain Cable is worn so that the mean diameter at its most worn part is reduced to the size given in the following Table it is to be renewed.

Size of Chain Cable originally.	Should be renewed when worn to	Size of Chain Cable originally.	Should be renewed when worn to	Size of Chain Cable originally.	Should be renewed when worn to	Size of Chain Cable originally.	Should be renewed when worn to
Diameter in inches.	Mean diameter in inches.	Diameter in inches.	Mean diameter in inches.	Diameter in inches.	Mean diameter in inches.	Diameter in inches.	Mean diameter in inches.
$\frac{11}{16}$	$\frac{20}{32}$	$1\frac{4}{16}$	$1\frac{2}{16}$	$1\frac{13}{16}$	$1\frac{10}{16}$	$2\frac{6}{16}$	$2\frac{2}{16}$
$\frac{12}{16}$	$\frac{21}{32}$	$1\frac{5}{16}$	$1\frac{3}{16}$	$1\frac{14}{16}$	$1\frac{11}{16}$	$2\frac{7}{16}$	$2\frac{3}{16}$
$\frac{13}{16}$	$\frac{23}{32}$	$1\frac{6}{16}$	$1\frac{7}{32}$	$1\frac{15}{16}$	$1\frac{23}{32}$	$2\frac{8}{16}$	$2\frac{4}{16}$
$\frac{14}{16}$	$\frac{25}{32}$	$1\frac{7}{16}$	$1\frac{9}{32}$	2	$1\frac{25}{32}$	$2\frac{9}{16}$	$2\frac{9}{32}$
$\frac{15}{16}$	$\frac{27}{32}$	$1\frac{8}{16}$	$1\frac{11}{32}$	$2\frac{1}{16}$	$1\frac{27}{32}$	$2\frac{10}{16}$	$2\frac{11}{32}$
1	$\frac{29}{32}$	$1\frac{9}{16}$	$1\frac{13}{32}$	$2\frac{2}{16}$	$1\frac{29}{32}$	$2\frac{11}{16}$	$2\frac{13}{32}$
$1\frac{1}{16}$	$\frac{15}{16}$	$1\frac{10}{16}$	$1\frac{15}{32}$	$2\frac{3}{16}$	$1\frac{31}{32}$	$2\frac{12}{16}$	$2\frac{15}{32}$
$1\frac{2}{16}$	1	$1\frac{11}{16}$	$1\frac{8}{16}$	$2\frac{4}{16}$	2	$2\frac{13}{16}$	$2\frac{17}{32}$
$1\frac{3}{16}$	$1\frac{1}{16}$	$1\frac{12}{16}$	$1\frac{9}{16}$	$2\frac{5}{16}$	$2\frac{1}{16}$	$2\frac{14}{16}$	$2\frac{9}{16}$

Extract from the Rules for Wood and Composite Vessels, Section 32.

Tonnage for Regulating the Scantlings and Equipment (as regards Anchors, Chains, &c.).

In flush-decked vessels having either one, two or three decks (not being spar or awning-decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels,* is to regulate all the scantlings of the hull, and also the equipment of the vessel, as regards anchors, chains, warps, &c.

† In vessels having a *raised quarter deck*, or a poop, or top-gallant forecastle, or deck houses, or awning-deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull, but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the tonnage of the space required for propelling power*, is to regulate the equipment.

But in vessels where the tonnage of the erections above the tonnage deck is less than that allowed for crew space, *then* the *difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

CAST STEEL ANCHORS.

All Cast Steel Anchors intended for vessels classed or proposed to be classed in the Society's Register Book must, in addition to undergoing the statutory tests, be subjected to the percussive, hammering, and bending tests recommended in the report of the Committee appointed by the Board of Trade to consider the question of tests of Cast Steel Anchors.

These tests, which are hereunder set forth, must be carefully and completely made in the presence and to the satisfaction of officers appointed by the Committee, viz. :—

PERCUSSIVE TEST.

1. Anchors, or when anchors are made of more than one piece, each piece shall be subject to this test, as follows :—

GIVEN WEIGHT.	GIVEN HEIGHT.
15 cwt. and below -	15 feet.
Above 15 cwt. -	12 feet.

The anchor or piece shall be raised the given height for the given weight and shall be dropped on an iron slab.

The given height means that the lowest part of the anchor or piece when suspended shall be at least the given height above the iron slab to which it is to be dropped.

2. An anchor of the Admiralty pattern shall first be raised vertically to the given height with its shanks and arms in a horizontal position, and shall be let fall from that height.

3. It shall then be raised a second time to the given height, and shall be suspended with the crown downwards. Two iron blocks shall be placed underneath it, and it shall be let fall from this position so that one of the blocks receives it on the middle of one arm, and the other block receives it on the middle of the other arm.

4. The slab for the horizontal test shall be of steel or iron, well laid on a solid concrete foundation to the satisfaction of the inspector.

5. If the slab on which the anchor falls is broken, the test shall be repeated until a slab is made that does not break.

6. The blocks for the vertical test shall be solid, and shall be of sufficient height to prevent the crown of the anchor from touching the slab, and shall be otherwise to the satisfaction of the inspector.

HAMMERING TEST.

7. When the percussive test has been passed successfully, to the satisfaction of the inspector, the anchor or piece shall be slung and freely put to a hammering test as follows, that is to say, it shall be well hammered over its parts with a sledge hammer weighing not less than 7 lbs., and shall be required to give under this treatment such a clear ring in all its parts as shall satisfy the inspector that the casting is sound, and without flaws existing, either originally or developed as the result of the application of the preceding percussive tests.

BENDING TEST.

8. Cast steel may be passed as sufficiently ductile for anchors when a piece of each casting, 8 inches in length, is cut from the casting, turned to 1 inch in diameter, and is then bent cold by hammering through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, without showing signs of flaw or fracture.

9. There must be a piece cast on each cast steel anchor, or on each portion of such anchor when it is made of more than one casting, and such piece must be of sufficient size to enable one test piece of the size before stated to be cut out of it, or it may be (at the discretion of the manufacturer) of sufficient size to enable four test pieces to be cut out of it. If it is only of sufficient size to enable one test piece to be cut out of it, that piece shall be subjected to the bending test named in paragraph 8, and, if it fails to withstand it, the casting is to be condemned.

If the piece is large enough to enable four test pieces to be cut out of it, these four test pieces shall be disposed of as follows, that is to say, one of them shall be turned in a lathe to 1 inch in diameter for a length of 8 inches, and bent cold through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, and if it withstands this test without flaw or fracture, shall be deemed to have withstood a satisfactory test for ductility. If the one test piece does not pass this test, all or any of the other three test pieces may be tested in a similar manner, and if any one of the four test pieces passes this test, the anchor or part of the anchor, as the case may be, shall be deemed so far satisfactory.

ANNEALING.

10. Each anchor must be properly and sufficiently annealed, and when so annealed, shall be stamped "annealed steel." Annealing is not to be regarded as proper, or efficient, unless the process extends from three days for small anchors, up to six days for large ones.

PROVING ESTABLISHMENTS.

The following Proving Establishments are recognised by the Committee of Lloyd's Register for the Testing of Anchors and Chains while licensed by the Board of Trade for that purpose:—

NETHERTON—Lloyd's Proving House	Superintendent,	Mr. H. Green.
TIPTON—Lloyd's Proving House	ditto	Mr. C. E. Perrins.
LOW WALKER—Lloyd's Proving House	ditto	Mr. A. Green.
CHESTER (Saltney)—Lloyd's Proving House	ditto	Mr. H. T. Welford.
GLASGOW—Lloyd's Proving House	ditto	Mr. E. Seedhouse.
CARDIFF—Lloyd's Proving House	ditto	Mr. G. W. Penn.
SUNDERLAND—Lloyd's Proving House	ditto	Mr. A. Green.
CRADLEY HEATH—Lloyd's Proving House	ditto	Mr. S. C. Paul.

N.B.—Vessels supplied with Anchors and Chain Cables tested at any of the Proving Establishments in the above list, will have the notation of "Lloyd'sA.&C.P." in the Register Book, signifying that the Anchors and Chain Cables have been tested at a machine under the control of the Committee of Lloyd's Register of Shipping.

The following Machines have been recognised by the Committee for the testing of Anchors and Chain Cables supplied to foreign owned vessels (*see* Section 50 of the Rules):—

AUSTRIA	Government Establishment at Pola.
,,	F. F. von Helldorf & Otto Rothart, Bruckl.
,,	Aktiengesellschaft Stahlwerke Weissenfels (for the testing of Small Chains only).
BELGIUM	The Antwerp Engineering Co., Société Anonyme, Rue des Indes, Antwerp.
,,	Société Anonyme de Clouteries Mécaniques, Fontaine l'Evêque (for the testing of Small Chains only).
,,	Société Anonyme des Fabriques de Chaînes & Pièces de Forge de Heppignies, près Fleurus.
,,	Société Anonyme des Usines Wattelar-Francq, Roux.
DENMARK	Government Establishment at Copenhagen.
FRANCE	E. Turbot, Anzin (Nord).
,,	Chantiers de la Loire, Nantes.
,,	Vve. E. Couillard, Succr., Havre.
,,	Dorémieux, Fils et Cie., St. Amand (Nord).
,,	E. Davaine, St. Amand (Nord).
,,	Marrel Frères, Capelette, Marseilles.
,,	M. Hemet, Havre.
,,	Mathieu Vivin & Louis Pierens, St. Amand-les-Eaux (Nord).
GERMANY	A. Borsig, Berg und Huttenverwaltung Borsigwerk, Borsigwerk, Oberschlesien.
,,	Duisburger Maschinenbau-Aktien Gesellschaft (vormals Bechem & Keetmann), Duisburg.
HOLLAND	Koninklijke Nederlandsche Grofsmederij, Leiden.
,,	Nederlandsche Ketting Fabriek, Schiedam.
SWEDEN	Government Establishment at Kongl. Tekniska Högskolan, Stockholm.
UNITED STATES	American Steel Casting Co., Chester, Pa. (for the testing of Anchors only).
,, ,,	Baldt Anchor Co., Chester, Pa. (for the testing of Anchors only).
,, ,,	Bradlee & Co.'s Works, Philadelphia, Pa.
,, ,,	Cape Ann Anchor Works, Gloucester, Mass.
,, ,,	J. B. Carr Co., Troy, N.Y.
,, ,,	Columbus Chain Co., Columbus, Ohio.
,, ,,	Frankford Chain Works, Frankford, Philadelphia, Pa.
,, ,,	Hayden-Corbett & Co., Columbus, Ohio.
,, ,,	Jones & Laughlin Steel Co., Pittsburg, Pa.
,, ,,	Lebanon Chain Works, Lebanon, Pa.
,, ,,	The Logan Iron and Steel Co., Burnham, Pa.
,, ,,	J. McKay & Co.'s Iron City Chain Works, McKees Rocks, near Pittsburg, Pa.
,, ,,	Monongahela Iron and Steel Co., Pittsburg, Pa.
,, ,,	The Seaboard Steel Castings Co., Chester, Pa. (for the testing of Anchors only).
,, ,,	Seneca Chain Co., Kent, Ohio.
,, ,,	The Standard Chain Co., Columbus, Ohio.
,, ,,	Weimer Chain & Iron Co., Lebanon, Pa.
,, ,,	West End Rolling Mills, Lebanon, Pa.
,, ,,	Whitehill Chain Works, Whitehill, Fieldsboro, N.J.
,, ,,	Woodhouse Chain Works, Trenton, N.J.

By order of the Committee,

ANDREW SCOTT,

Secretary.

LONDON.—*1st June, 1911.*

T

VESSELS INTENDED TO CARRY OIL IN BULK.

WEB FRAMES and STRINGERS.

TABLE 32.

(See continuation.)

TRANSVERSE NUMBER. B + D.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF ORDINARY FLOORS AT CENTRE TO TOP OF BEAMS AT SIDE OF TANK DECK.															
	feet. 11 and under 12	feet. 12 and under 13	feet. 13 and under 14	feet. 14 and under 15	feet. 15 and under 16	feet. 16 and under 17	feet. 17 and under 18	feet. 18 and under 19	feet. 19 and under 20	feet. 20 and under 21	feet. 21 and under 22	feet. 22 and under 23	feet. 23 and under 24	feet. 24 and under 25	feet. 25 and under 26	feet. 26 and under 27
	<——TWO SIDE STRINGERS——>							<——THREE SIDE STRINGERS——>					<——FOUR SIDE STRINGERS——>			
feet.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
45 and under 48	12 × ·26	13 × ·26	13 × ·28	13 × ·30	14 × ·30	14 × ·32	14 × ·34									
48 and under 51	13 × ·26	13 × ·28	13 × ·30	14 × ·30	14 × ·32	14 × ·34	14 × ·36	15 × ·36								
51 and under 54	13 × ·28	13 × ·30	14 × ·30	14 × ·32	14 × ·34	14 × ·36	15 × ·36	16 × ·36	16 × ·38							
54 and under 57	13 × ·30	14 × ·30	14 × ·32	14 × ·34	14 × ·36	15 × ·36	16 × ·36	16 × ·38	17 × ·38	18 × ·38						
57 and under 60	14 × ·30	14 × ·32	14 × ·34	14 × ·36	15 × ·36	16 × ·36	16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·42				
60 and under 63	14 × ·32	14 × ·34	14 × ·36	15 × ·36	16 × ·36	16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·40	21 × ·42	22 × ·44	24 × ·44		
63 and under 66	14 × ·34	14 × ·36	15 × ·36	16 × ·36	16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·40	21 × ·40	22 × ·42	23 × ·44	24 × ·46	26 × ·46	27 × ·48
66 and under 69		15 × ·36	16 × ·36	16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·44	24 × ·44	25 × ·46	26 × ·48	28 × ·48
69 under under 72			16 × ·38	17 × ·38	18 × ·38	18 × ·40	19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·42	23 × ·44	24 × ·46	26 × ·46	27 × ·48	28 × ·50
72 and under 75				18 × ·38	18 × ·40	19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·42	23 × ·42	24 × ·44	25 × ·46	26 × ·48	28 × ·48	29 × ·50
75 and under 78					19 × ·40	20 × ·40	20 × ·42	21 × ·42	22 × ·42	22 × ·44	23 × ·44	24 × ·46	26 × ·46	27 × ·48	28 × ·50	30 × ·50
78 and under 81						20 × ·42	21 × ·42	22 × ·42	22 × ·44	23 × ·44	24 × ·44	25 × ·46	26 × ·48	28 × ·48	29 × ·50	30 × ·52
81 and under 84							22 × ·42	22 × ·44	23 × ·44	24 × ·44	25 × ·44	26 × ·46	27 × ·48	28 × ·50	30 × ·50	31 × ·52
84 and under 87								23 × ·44	24 × ·44	24 × ·46	25 × ·46	26 × ·48	28 × ·48	29 × ·50	30 × ·52	32 × ·52
87 and under 90									24 × ·46	25 × ·46	26 × ·46	27 × ·48	28 × ·50	30 × ·50	31 × ·52	32 × ·54
90 and under 93										26 × ·48	27 × ·48	28 × ·50	30 × ·50	31 × ·52	32 × ·54	34 × ·54
93 and under 96											29 × ·48	30 × ·50	31 × ·52	32 × ·54	34 × ·54	35 × ·56
96 and under 99												31 × ·52	32 × ·54	34 × ·54	35 × ·56	36 × ·58

The stringers are to be of the same dimensions as the web frames and are to be attached to the outside plating by double angles for a length of three frame spaces on each side of the bulkheads.

The web frames are to be spaced not more than four frame spaces apart.

The web frames are to be attached to the outside plating by double angles where their depth is 24 inches or above.

VESSELS INTENDED TO CARRY OIL IN BULK.

INTERMEDIATE FRAMES, FACE ANGLES, &c.

TABLE 32.
(Concluded.)

TRANSVERSE NUMBER. B + D.	FRAME SPACING	INTERMEDIATE FRAMES. Built Framing. Frames*	Reversed Frames.†	Bulb Angles.	ANGLES ATTACHING WEB FRAMES, SIDE STRINGERS AND KEELSONS TO OUTSIDE PLATING; DOUBLE FACE ANGLES TO WEB FRAMES AND STRINGERS; AND DOUBLE ANGLES CONNECTING STRINGERS TO WEB FRAMES.	SINGLE FACE ANGLES TO WEB FRAMES AND SIDE STRINGERS.	BUTT STRAPS FOR STRINGER FACE ANGLES. Dimensions. Length.	Breadth.	Thickness.	Rivets. Number in Straps and Stringer Face Angles.	Number in Straps and Web Frame Face Angles.	WEB FRAMES IN 'TWEEN DECKS. Depth. At Heel.	At Head.	Thickness.
feet.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.			inches.	inches.	inches.
45 and under 48	22½	3½ × 3 × ·30	2½ × 2½ × ·30		3 × 3 × ·30	5 × 3 × ·48	33	10	·46	16	4			
48 and under 51	22½	3½ × 3 × ·30	3 × 2½ × ·30		3 × 3 × ·30	5 × 3 × ·48	”	”	”	”	”			
51 and under 54	23	3½ × 3 × ·30	3 × 3 × ·30		3 × 3 × ·32	5 × 3 × ·50	”	”	”	”	”			
54 and under 57	23	4 × 3 × ·30	3 × 3 × ·30		3 × 3 × ·34	5 × 3 × ·52	”	”	·48	”	”	15	15	·34
57 and under 60	23½	4½ × 3 × ·30	3 × 3 × ·30	5½ × 3 × ·36	3 × 3 × ·36	5 × 3½ × ·52	42	11	”	20	6	15	15	·34
60 and under 63	23½	4½ × 3 × ·32	3 × 3 × ·32	5½ × 3 × ·38	3½ × 3 × ·36	5 × 3½ × ·54	”	”	·50	”	”	15	15	·36
63 and under 66	24	5 × 3 × ·32	3 × 3 × ·32	6 × 3 × ·38	3½ × 3 × ·38	6 × 3½ × ·54	”	”	”	”	”	18	15	·36
66 and under 69	24	5 × 3 × ·34	3 × 3 × ·34	6 × 3 × ·40	3½ × 3 × ·40	6 × 3½ × ·56	”	”	·52	”	”	21	18	·38
69 and under 72	24½	5½ × 3½ × ·34	3 × 3 × ·34	6½ × 3½ × ·40	3½ × 3½ × ·40	6½ × 3½ × ·58	45	12	”	”	”	24	18	·38
72 and under 75	24½	5½ × 3½ × ·34	3½ × 3 × ·34	6½ × 3½ × ·40	3½ × 3½ × ·42	6½ × 3½ × ·60	”	”	·54	”	”	27	21	·38
75 and under 78	25	5½ × 3½ × ·36	3½ × 3 × ·36	6½ × 3½ × ·42	3½ × 3½ × ·44	7 × 3½ × ·60	”	”	”	”	”	30	21	·40
78 and under 81	25	6 × 3½ × ·36	3½ × 3 × ·36	7 × 3½ × ·42	3½ × 3½ × ·46	7 × 3½ × ·62	”	”	·56	”	”	30	21	·40
81 and under 84	25½	6 × 3½ × ·38	3½ × 3 × ·38	7 × 3½ × ·44	3½ × 3½ × ·48	7 × 3½ × ·64	”	”	”	”	”	33	21	·42
84 and under 87	25½	6½ × 3½ × ·38	3½ × 3 × ·38	7½ × 3½ × ·44	3½ × 3½ × ·50	7 × 3½ × ·66	”	”	·58	”	”	33	21	·42
87 and under 90	26	6½ × 3½ × ·40	3½ × 3 × ·40	7½ × 3½ × ·46	3½ × 3½ × ·52	7 × 3½ × ·68	”	”	”	”	”	36	24	·44
90 and under 93	26	7 × 3½ × ·40	3½ × 3 × ·40	8 × 3½ × ·46	4 × 3½ × ·52	7 × 3½ × ·72	”	”	·60	”	”	36	24	·44
93 and under 96	26½	7 × 3½ × ·42	3½ × 3 × ·42	8 × 3½ × ·48	4 × 3½ × ·54	7 × 3½ × ·76	”	”	”	”	”	39	24	·46
96 and under 99	26½	7 × 3½ × ·42	3½ × 3½ × ·42	8½ × 3½ × ·48	4 × 3½ × ·56	7 × 3½ × ·80	”	”	·62	”	”	39	24	·46

*The frames in the 'tween decks, may be of angles ·06 of an inch thicker than required by the Table, in which case the reversed frames may be dispensed with.

†The reversed frame at upper edge of floor plates to be of the dimensions required for double face angles on webs.

Lloyd's Register of British and Foreign Shipping, London.—*17th June 1909.*

VESSELS INTENDED TO CARRY OIL IN BULK.

FLOOR PLATES. TABLE 33.

TRANSVERSE NUMBER. B + D	DEPTH AT CENTRE.	THICKNESS. * For $\frac{3}{5}$ length Amidships.	THICKNESS. * At Ends.	TRANSVERSE NUMBER. B + D	DEPTH AT CENTRE.	THICKNESS. * For $\frac{3}{5}$ length Amidships.	THICKNESS. * At Ends.
feet.	inches.	inches.	inches.	feet.	inches.	inches.	inches.
45 and under 46	17	·34	·30	68 and under 70	28	·46	·38
46 and under 47	18	·34	·30	70 and under 72	29	·46	·38
47 and under 48	18	·36	·32	72 and under 74	30	·46	·38
48 and under 49	19	·36	·32	74 and under 76	30	·48	·38
49 and under 50	20	·36	·32	76 and under 78	31	·48	·38
50 and under 51	20	·38	·34	78 and under 80	32	·48	·38
51 and under 52	21	·38	·34	80 and under 82	32	·50	·40
52 and under 53	22	·38	·34	82 and under 84	33	·50	·40
53 and under 54	22	·40	·34	84 and under 86	34	·50	·40
54 and under 55	23	·40	·34	86 and under 88	35	·50	·40
55 and under 56	24	·40	·34	88 and under 90	35	·52	·40
56 and under 58	24	·42	·36	90 and under 92	36	·52	·40
58 and under 60	25	·42	·36	92 and under 94	37	·52	·40
60 and under 62	26	·42	·36	94 and under 96	38	·52	·40
62 and under 64	26	·44	·36	96 and under 98	38	·54	·42
64 and under 66	27	·44	·36	98 and under 100	39	·54	·42
66 and under 68	28	·44	·36				

* In the engine space of steam vessels the floors are to be ·04 of an inch thicker, and in the boiler space ·10 of an inch thicker than required by the Table.

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VESSELS INTENDED TO CARRY OIL IN BULK.

FLAT KEEL ANGLES, and SIDE and BILGE KEELSONS. TABLE 34.

LONGITUDINAL NUMBER. L × (B + D)	FLAT KEEL ANGLES.		SIDE AND BILGE KEELSONS.				
						Angles on Vertical Plate.	
	For ½ ength Amidships.	Thickness at Ends.	For ½ length Amidships.	Thickness at Ends.	Intercostal Plates.	For ½ length Amidships.	Thickness at Ends.
	inches.	inches.	inches.	inches.	inches.	inches.	inches.
			Double Angles.				
7000 and under 7600	3½ × 3½ × ·38	·38	3½ × 3 × ·34	·34	·32		
7600 and under 8200	3½ × 3½ × ·40	·38	4 × 3 × ·34	·34	·32		
8200 and under 8800	4 × 4 × ·40	·38	4 × 3 × ·34	·34	·32		
8800 and under 9400	4 × 4 × ·40	·38	4 × 3 × ·36	·34	·34		
9400 and under 10000	4½ × 4½ × ·40	·38	4 × 3 × ·36	·34	·34		
10000 and under 10600	4½ × 4½ × ·40	·38	4½ × 3 × ·36	·34	·34		
10600 and under 11800	4½ × 4½ × ·42	·40	4½ × 3½ × ·36	·34	·36		
11800 and under 12400	4½ × 4½ × ·42	·40	5 × 3½ × ·36	·34	·36		
12400 and under 13000	4½ × 4½ × ·42	·40	5 × 3½ × ·38	·36	·38		
13000 and under 14200	4½ × 4½ × ·44	·42	5 × 3½ × ·40	·36	·38		
14200 and under 15400	4½ × 4½ × ·44	·42	5½ × 3½ × ·40	·36	·38		
15400 and under 16000	4½ × 4½ × ·46	·44	5½ × 3½ × ·42	·36	·38		
16000 and under 16600	4½ × 4½ × ·46	·44	6 × 3½ × ·42	·36	·40		
16600 and under 17200	5 × 5 × ·46	·44	6 × 3½ × ·42	·36	·40		
			Double Bulb Angles.				
17200 and under 18000	5 × 5 × ·48	·46	7 × 3½ × ·42	·40	·40		
18000 and under 19000	5 × 5 × ·50	·46	8 × 3½ × ·46	·44	·40		
19000 and under 20000	5 × 5 × ·50	·46	9 × 3½ × ·50	·46	·40		
20000 and under 21000	5 × 5 × ·52	·48	10 × 3½ × ·54	·48	·40		
			Vertical Plate,	and Four	Angles.		
21000 and under 22000	5 × 5 × ·54	·50	11 × ·50	·40	·42	6½ × 3½ × ·44	·38
22000 and under 24000	5 × 5 × ·54	·50	12 × ·52	·42	·42	6½ × 3½ × ·46	·38
24000 and under 26000	5 × 5 × ·56	·52	13 × ·54	·44	·42	6½ × 3½ × ·46	·38
26000 and under 28000	5 × 5 × ·56	·52	14 × ·56	·46	·42	6½ × 3½ × ·48	·38
28000 and under 30000	5 × 5 × ·58	·54	15 × ·58	·48	·42	6½ × 3½ × ·48	·38
30000 and under 32000	5 × 5 × ·58	·54	16 × ·60	·50	·42	6½ × 3½ × ·50	·40
32000 and under 34000	5 × 5 × ·60	·54	17 × ·62	·52	·42	6½ × 3½ × ·50	·40
34000 and under 36000	5 × 5 × ·60	·54	18 × ·64	·54	·44	7 × 3½ × ·50	·40
36000 and under 39000	5 × 5 × ·60	·54	19 × ·66	·56	·44	7 × 3½ × ·50	·40
39000 and under 42000	6 × 6 × ·60	·54	20 × ·68	·58	·44	7 × 3½ × ·50	·40
42000 and under 46000	6 × 6 × ·60	·54	21 × ·70	·60	·44	7 × 3½ × ·50	·40
46000 and under 50000	6 × 6 × ·60	·54	22 × ·72	·62	·44	7 × 3½ × ·50	·40

Where the breadth of the vessel is under 50 feet, two keelsons of the dimensions required by the Table are to be fitted on each side. Where the breadth is 50 feet and under 64 feet, three keelsons are to be fitted on each side, in which case the depth of the vertical plates may be one-fourth less than given in the Table.

The keelsons required by the above Table are, so far as is practicable, to extend throughout the oil compartments and machinery space.

VESSELS INTENDED TO CARRY OIL IN BULK.

BULKHEADS. TABLE 35.

DEPTH FROM TOP OF FLOORS TO TOP OF BEAMS AT CENTRE OF TANK DECK.✻	THICKNESS OF BULKHEAD PLATING.			VERTICAL STIFFENING BARS. ✻✻		HORIZONTAL GIRDERS BELOW TANK DECK.				WEB FRAMES ON TRANSVERSE BULKHEADS. DEPTH AT HEEL.†
	Below Tank Deck. At Floor.	Below Tank Deck. At Tank Deck.	In Expansion Trunk.	Bulb Angles below Tank Deck.	Angles in Expansion Trunk.	1st (at bottom).	2nd.	3rd.	4th.	
feet.	inches.	inches.	inches.	inches.	inches.	inches. Channel.	inches. Channel.	inches. Channel.	inches. Channel.	inches.
12 and under 13	·34	·32	·30	5½ × 3 × ·34	5 × 3 × ·30	9 × 3½ × 3½ × ·50	9 × 3½ × 3½ × ·50			16
13 and under 14	·36	·32	·30	5½ × 3 × ·36	5 × 3 × ·32	10 × 3½ × 3½ × ·50	9 × 3½ × 3½ × ·50			18
14 and under 15	·36	·32	·30	5½ × 3 × ·38	5 × 3 × ·32	10 × 3½ × 3½ × ·50	10 × 3½ × 3½ × ·50			20
15 and under 16	·38	·34	·32	6 × 3 × ·38	5 × 3 × ·34	12 × 3½ × 3½ × ·50	10 × 3½ × 3½ × ·50			22
16 and under 17	·38	·34	·32	6 × 3 × ·40	5 × 3 × ·34	12 × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·50			24
17 and under 18	·40	·34	·32	6½ × 3 × ·40	5 × 3 × ·36	15 × 4 × 4 × ·52	12 × 3½ × 3½ × ·50			26
18 and under 19	·40	·36	·34	6½ × 3 × ·42	5 × 3 × ·36	15 × 4 × 4 × ·52	15 × 4 × 4 × ·52			28
19 and under 20	·42	·36	·34	6½ × 3 × ·42	5 × 3 × ·38	15 × 4 × 4 × ·52	12 × 3½ × 3½ × ·50	12 × 3½ × 3½ × ·50		30
20 and under 21	·42	·36	·34	7 × 3 × ·42	5 × 3 × ·38	15 × 4 × 4 × ·52	15 × 4 × 4 × ·52	12 × 3½ × 3½ × ·50		32
21 and under 22	·44	·38	·36	7 × 3 × ·44	5 × 3 × ·40	15 × 4 × 4 × ·52	15 × 4 × 4 × ·52	15 × 4 × 4 × ·52		34
22 and under 23	·44	·38	·36	7½ × 3 × ·44	5 × 3 × ·40	Plate. 20 × ·40	15 × 4 × 4 × ·52	15 × 4 × 4 × ·52		36
23 and under 24	·44	·38	·36	7½ × 3 × ·46	5½ × 3 × ·40	22 × ·40	Plate. 20 × ·40	15 × 4 × 4 × ·52		38
24 and under 25	·46	·40	·38	7½ × 3 × ·46	5½ × 3 × ·40	22 × ·40	20 × ·40	15 × 4 × 4 × ·52	15 × 4 × 4 × ·52	40
25 and under 26	·46	·40	·38	8 × 3 × ·46	5½ × 3 × ·40	24 × ·42	22 × ·40	Plate. 20 × ·40	15 × 4 × 4 × ·52	Two frame spaces.
26 and under 27	·46	·40	·38	8 × 3 × ·48	5½ × 3 × ·40	26 × ·44	24 × ·44	22 × ·42	Plate. 20 × ·40	”
27 and under 28	·48	·42	·40	8½ × 3 × ·48	5½ × 3 × ·40	28 × ·46	26 × ·44	24 × ·42	21 × ·40	”
28 and under 29	·48	·42	·40	8½ × 3 × ·50	5½ × 3 × ·40	30 × ·46	27 × ·44	25 × ·42	22 × ·40	”
29 and under 30	·48	·42	·40	8½ × 3 × ·52	5½ × 3 × ·40	32 × ·48	29 × ·46	26 × ·42	23 × ·40	”
30 and under 31	·50	·44	·42	9 × 3 × ·52	5½ × 3 × ·40	34 × ·48	30 × ·46	27 × ·44	24 × ·40	”
31 and under 32	·50	·44	·42	9 × 3 × ·54	5½ × 3 × ·40	36 × ·50	32 × ·48	29 × ·44	25 × ·40	”
32 and under 33	·50	·44	·42	9 × 3 × ·56	5½ × 3 × ·40	38 × ·50	34 × ·48	30 × ·44	26 × ·40	”

✻ The depth is to be measured at the middle of the length of the vessel except for the thickness of bottom part of bulkhead plating, vertical stiffeners and horizontal girders below tank deck in which cases the depth is to be measured at the bulkheads.

✻✻ The vertical stiffeners on the middle line bulkheads are to be spaced as required for the frames of the vessel and those on the transverse bulkheads are also to be spaced as required for the frames, but are in no case to be more than 24 inches apart centre to centre.

Web plates are to be fitted to the middle line bulkheads opposite the web frames at the side of the vessel. Their thickness is to be as required for the plating of the lower part of the bulkhead, and the depth at the heel is not to be less than that of the floors at centre, and that at the head not less than two-thirds that at the heel.

† Two web plates are to be fitted to the transverse bulkheads on each side of the middle line where the breadth is less than 50 feet, and three where the breadth is 50 feet and under 64 feet. The web plates are to be of the thickness required for the plating of the lower part of the bulkhead. Their depth at heel is to be as given in the Table, and the depth at head equal to one frame space, but need not exceed that required at the heel.

Where the horizontal girders on bulkheads are formed of plates they are to have a bulb angle face bar of the dimensions required for the vertical stiffeners.

VESSELS INTENDED TO CARRY OIL IN BULK.

EXPANSION TRUNKS and BULKHEAD BOUNDARY BARS.

TABLE 36.

TRANSVERSE NUMBER. B + D	SIDES OF EXPANSION TRUNK.			ANGLES ATTACHING TRANSVERSE BULKHEADS TO OUTSIDE PLATING.		ANGLES ATTACHING TRANSVERSE BULKHEADS TO TANK DECK AND SIDES AND TOP OF EXPANSION TRUNK.	
	Thickness of Plating.	Vertical Angle Stiffeners.	Web Plates.	Double.	Single.	Double.	Single.
feet.	inches.	inches.	inches.	inches.	inches.	inches.	inches.
45 and under 48	·30	5 × 3 × ·38	12 × ·36	3 × 3 × ·30 3 × 3 × ·30	4 × 4 × ·40	3 × 3 × ·30	4 × 4 × ·40
48 and under 51	·32	5 × 3 × ·38	13 × ·38	3½ × 3 × ·30 3½ × 3 × ·30	4½ × 4½ × ·40	3 × 3 × ·30	4½ × 4½ × ·40
51 and under 54	·32	5 × 3 × ·40	14 × ·40	3½ × 3 × ·32 3½ × 3 × ·32	5 × 5 × ·40	3 × 3 × ·32	4½ × 4½ × ·40
54 and under 57	·34	5 × 3 × ·40	15 × ·40	4 × 3 × ·34 4 × 3 × ·34	5 × 5 × ·42	3 × 3 × ·34	4½ × 4½ × ·40
57 and under 60	·34	5 × 3 × ·40	16 × ·40	4 × 3 × ·36 4 × 3 × ·36	5 × 5 × ·42	3 × 3 × ·36	5 × 5 × ·40
60 and under 63	·36	5½ × 3 × ·40	17 × ·40	5½ × 3 × ·36 3 × 3 × ·36	5 × 5 × ·44	3 × 3 × ·36	5 × 5 × ·40
63 and under 66	·36	5½ × 3 × ·40	18 × ·40	5½ × 3 × ·38 3 × 3 × ·38	5 × 5 × ·44	3 × 3 × ·38	5 × 5 × ·42
66 and under 69	·38	5½ × 3 × ·40	18 × ·40	5½ × 3 × ·40 3 × 3 × ·40	5 × 5 × ·46	3 × 3 × ·40	5 × 5 × ·42
69 and under 72	·38	5½ × 3 × ·40	19 × ·40	6 × 3½ × ·40 3½ × 3½ × ·40	5 × 5 × ·48	3½ × 3½ × ·40	5 × 5 × ·44
72 and under 75	·40	6 × 3 × ·40	20 × ·40	6 × 3½ × ·42 3½ × 3½ × ·42	5 × 5 × ·50	3½ × 3½ × ·42	5 × 5 × ·44
75 and under 78	·40	6 × 3 × ·40	21 × ·40	6 × 3½ × ·44 3½ × 3½ × ·44	5 × 5 × ·50	3½ × 3½ × ·44	5 × 5 × ·46
78 and under 81	·40	6 × 3 × ·40	22 × ·40	6 × 3½ × ·46 3½ × 3½ × ·46	6 × 6 × ·50	3½ × 3½ × ·46	5 × 5 × ·46
81 and under 84	·42	6½ × 3 × ·40	23 × ·40	6 × 3½ × ·48 3½ × 3½ × ·48	6 × 6 × ·50	3½ × 3½ × ·48	5 × 5 × ·48
84 and under 87	·42	6½ × 3 × ·40	24 × ·40	6 × 3½ × ·50 3½ × 3½ × ·50	6 × 6 × ·50	3½ × 3½ × ·50	5 × 5 × ·50
87 and under 90	·42	6½ × 3 × ·40	24 × ·40	6 × 3½ × ·52 3½ × 3½ × ·52	6 × 6 × ·52	3½ × 3½ × ·50	6 × 6 × ·50
90 and under 93	·44	6½ × 3 × ·40	25 × ·40	6½ × 3½ × ·52 3½ × 3½ × ·52	6 × 6 × ·52	3½ × 3½ × ·50	6 × 6 × ·50
93 and under 96	·44	6½ × 3 × ·40	25 × ·40	7 × 3½ × ·54 3½ × 3½ × ·54	6 × 6 × ·54	3½ × 3½ × ·50	6 × 6 × ·50
96 and under 99	·44	6½ × 3 × ·40	26 × ·40	7 × 3½ × ·56 3½ × 3½ × ·56	6 × 6 × ·56	3½ × 3½ × ·50	6 × 6 × ·52

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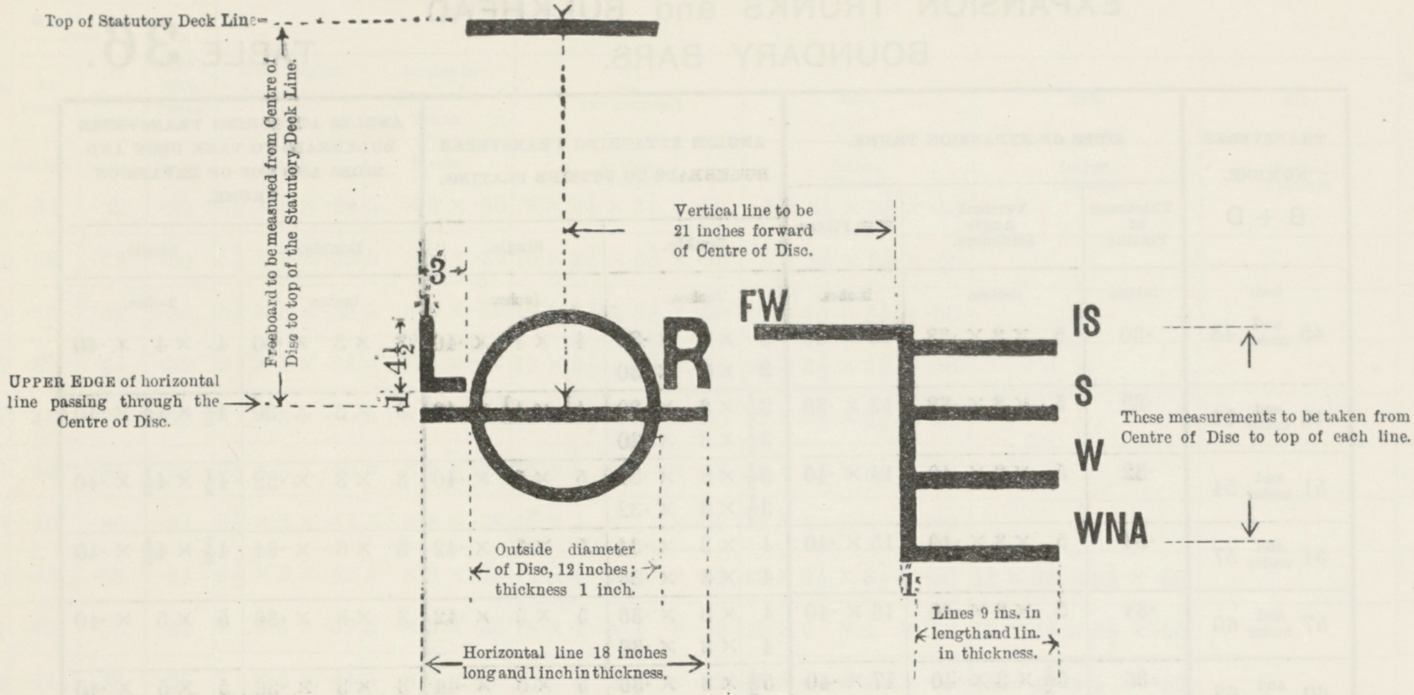
ASSIGNMENT OF FREEBOARD.

Under the Merchant Shipping Act, 1894, the Committee of Lloyd's Register are empowered to assign freeboards to British Vessels as required by the Act. Forms of application for the assignment of freeboard can be obtained from the London, or other, offices of the Society.

The mode of Marking, approved by the Board of Trade, is as follows:—

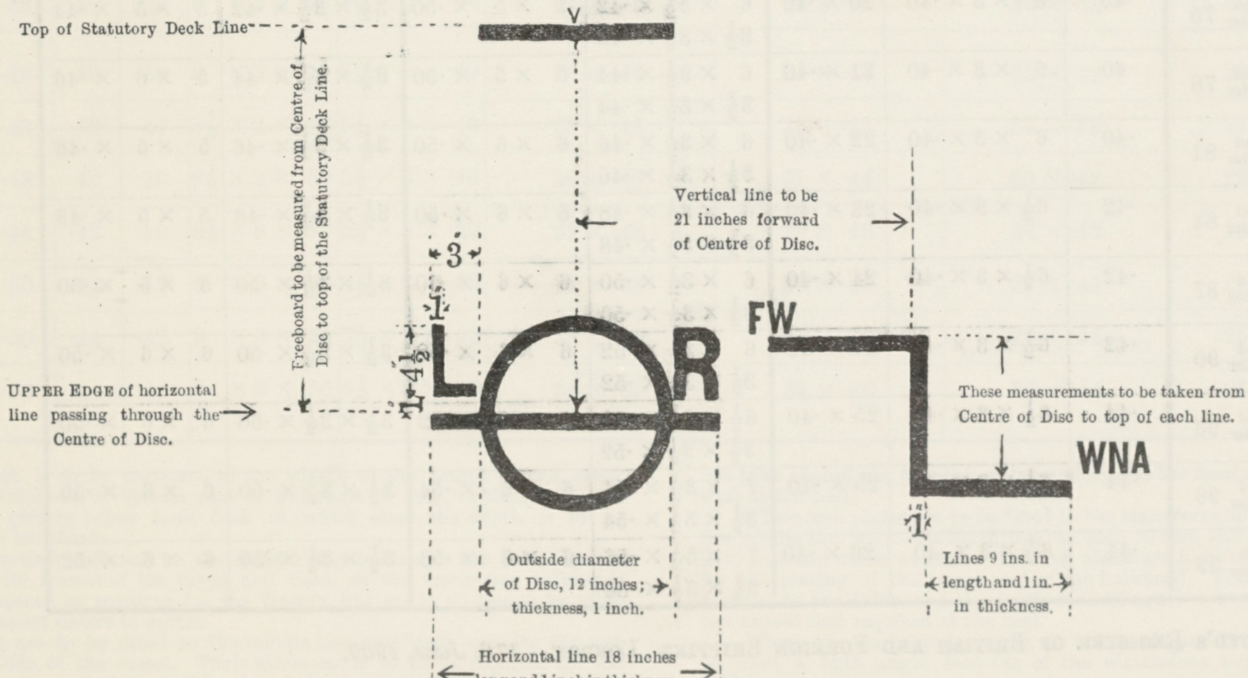
FREEBOARD MARKING FOR STEAMERS.



The Centre of Disc to be placed on both sides of vessel amidships, *i.e.*, at the middle of the length of the load water line. Vessels are to be marked with such of the horizontal lines are as applicable to the nature of their employment. In accordance with the regulations made by the Board of Trade, the discs and lines must be permanently marked by centre punch marks or cutting, and the particulars given in the Certificate are to be entered in the official log.

N.B.—It is a condition on which an awning or shelter deck or partial awning deck vessel is classed in the Society's Register Book that the Freeboard assigned shall be marked on the vessel's sides as above prescribed; and, under the provisions of Section 44 of the Society's Rules for Steel Ships. If the vessel proceed to sea with a less freeboard than that approved by the Committee, or if the freeboard mark be placed higher than the position assigned by the Committee, the vessel will be liable to have her class expunged from the Register Book.

FREEBOARD MARKING FOR SAILING VESSELS.



The Centre of Disc to be placed on both sides of vessel amidships, *i.e.*, at the middle of the length of the load line. Coasting vessels are required to be marked with only the maximum load line in fresh water. In accordance with the regulations made by the Board of Trade, the disc and lines must be permanently marked by centre punch marks or cutting and the particulars given in the Certificate are to be entered in the official log.